

CASSELL'S
ENCYCLOPÆDIA
OF GENERAL INFORMATION

WITH COLOURED PLATES AND MAPS
AND NUMEROUS FULL-PAGE ENGRAVINGS

STAËL—ZYMOTIC

SPECIAL EDITION



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CASSELL'S ENCYCLOPÆDIA OF GENERAL INFORMATION.

Staël-Holstein, ANNE LOUISE GERMAINE NECKER, BARONNE DE, novelist, essayist, and woman of letters, was the daughter of Necker, the great Finance Minister of Louis XVI., and was born in Paris on April 22nd, 1766. She received a first-class education, and the society she met at her father's house helped largely



MADAME DE STAËL.

to develop her genius. Her highly-strung and nervous temperament found a congenial attraction in the writings of Jean Jacques Rousseau, and her first work was a series of letters on them, published in 1788. In 1786 she married Eric Magnus, Baron de Staël-Holstein, Swedish ambassador at Paris, though, as is often the case in such *mariages de convenance*, she had not expressed any affection for him, he being much older than herself; but socially he was a desirable husband, and they agreed well enough. For some years they lived at Paris, and she took a very active part in the events which occurred during the early period of the Revolution, sustaining the royal

family by her sympathy, and doing a great deal to mitigate their troubles. In 1793 she published a very powerful appeal on behalf of Marie Antoinette, and shortly afterwards left Paris, in time to escape the Reign of Terror. She spent part of her time at Coppet, her father's estate on the Lake of Geneva, and part at Mickleham, in Surrey, England. Returning to Paris in 1795, her salon became the centre of much literary and political activity, and, after the rise of Napoleon, she viewed his actions with great suspicion. She detested him cordially and the dislike was mutual. In every possible way she opposed his will, and finally enraged him so much that in 1801 she was ordered to quit Paris in twenty-four hours—a *coup* which cruelly wounded her, as it broke up her salon and lost her some adherents. Her husband died in 1802, and she went to Germany, where she became the friend of Goethe, Schiller, Wieland, and others. In the year just mentioned she published one of her chief works, *Delphine*, a romance which attracted many readers by its passionate, poetical style. After travelling in different countries she once more entered France; but in 1807, on the publication of her best-known work, *Corinne*, she was again compelled to leave the country. Her next great work was the book on Germany—*L'Allemagne* (1813)—which had a tremendous effect on French literature, as it first introduced to her countrymen the leading German writers, and proved to be one of the germs of the Romantic movement in France. It had appeared in Paris in 1811 (in which year she privately married a young Swiss officer named Rocca), but was seized by the censors and destroyed, and Madame de Staël, who had again settled in France, left that country for the last time and settled at Coppet, but returned to Paris in 1816, and died there on July 14th, 1817. Her *Considérations sur la Révolution Française* and her *Dix Années d'Exil* were her latest works of consequence. The latter was published after her death, and is a record of her persecution by Napoleon. She exercised an extraordinary influence upon her contemporaries, but her reputation as a writer has not wholly stood the test of time.

Staffa (from a word meaning the island of columns, or staves), an island of the Inner Hebrides, Scotland, belonging to Argyllshire, 6 miles N. by E. of Iona and about 8 miles W. of Mull. It is one mile and a half in circumference, has the aspect of a rough table-land resting upon pillars, is uninhabited, and yields a scanty herbage on which a few sheep are sometimes pastured. It is remarkable for the number and variety of the caves which



FINGAL'S CAVE, STAFFA.

have been hollowed out of its sides by wave and weather. The island is of volcanic origin, being a fragment of an ancient stream of lava, and the basaltic formation accounts for the striking shapes that the caves present. The principal caverns are the Clamshell or Scallop Cave, in which the columns on one side are bent so as to form a series of ribs not unlike those of a ship and which is about 30 feet high, 17 feet wide at the mouth, and 130 feet long; the Boat Cave, accessible only by boat; the Cormorants' or Mackinnon's Cave, and, the most celebrated of all, Fingal's Cave, which is visited by Messrs. Macbrayne's steamer from Oban, from which it is 50 miles distant by

the route taken. The steamer usually sails six days a week throughout the summer for the convenience of tourists, and is generally met near the island by specially-built barge-like boats manned by seamen from Ulva. Tourists are landed at the Colonnade, a pavement of broken prisms of basalt, covered with limpets and seaweed, bounded on one side by the vertical columns of the isle and on the other by the green sea. In the Colonnade are the Wishing Chair, formed by a column that has broken short, in which as one sits one has but to wish three separate wishes and they are sure to be granted, and the Corner Stone, the only square stone in the island. Fingal's Cave was first visited in 1772 by Sir Joseph Banks. It is 227 feet long, 42 feet wide, 66 feet high, and at ebb has 25 feet depth of water. On its western side the pillars are 36 feet high, and on its eastern 18 feet high. From the entrance to the end it is penetrated by a pavement of broken basalt pillars, "fitting together," says Constance Gordon Cumming, "in faultless honeycomb." It is the haunt of seals, cormorants and other sea birds. In bright sunshine the play of colour is exquisite, the basalt combining every tint of warm red, brown, and rich maroon; seaweeds and lichens touch it up with green and gold, while here and there the lime has filtered through and crusted the pillars a pure snow-white. From the sombre roof of smooth rock or broken pillars are suspended yellow, crimson, and white stalactites. The floor is the green sea, from which on either side rise the columns with a regularity so unbroken as to suggest the hand of man rather than the work of Nature. Looking outwards from the interior the scene is wonderful, as the sunlight tips the Atlantic waves which come surging in with steady swing and break, with full resounding boom, in the innermost recesses of the cavern. Occasionally the huge tidal wave, which is a feature of this sea, and for which the wary are always on the watch, rolls into the cave sweeping everything before it. In 1884 such a wave rushed in while a few persons were exploring, and one of the party was drowned.

Stafford, the capital of Staffordshire, England, on the left bank of the Sow, 27 miles N.W. of Birmingham. It figures in the *Saxon Chronicle* as Betheney. At the time of the Conquest it possessed a royal mint and the castle erected by William I. was placed under the governorship of his friend de Torri, who took the name of de Stafford from the town and founded the Stafford family. This castle was rebuilt in the reign of Edward III., but being held for the Royalists at the time of the Civil War was demolished by the Cromwellian general, Sir William Brereton, in 1643. In 1810 another castle was begun on the site of the former one, but was not finished, and is now partly ruinous. The town was granted a charter by John in 1206, and this was ratified by Edward VI. and Elizabeth. St. Chad's, the

oldest church, was originally of Saxon design, but was rebuilt in the Perpendicular. It suffered much from neglect and uncouth treatment, but restoration in the latter half of the 19th century disclosed some of its ancient beauty. St. Mary's, the finest of the churches, contains Transition, Early English, and later work, with traces of Norman. It has a bust of Izaak Walton, who was born in the parish in 1593. The Grammar School dates from the reigns of Henry VIII. and Edward VI., was replaced by new buildings in 1862, and reorganised in 1872. Other prominent buildings are the County Council Hall, Shire Hall, Borough Hall, Oddfellows' Hall, Market Hall, William Salt Library (founded in 1872), Free Library, County Technical Institution, the College Almshouses, and several beautiful examples of half-timbered houses. Part of the common to the north of the town is reserved, under the name of Stone Plat, as a public recreation ground, while a portion of Coton Field, to the north-east, is laid out in garden allotments. The chief industries are tanning, the making of ladies' boots and shoes, and salt-making. Pop. (1901), 20,895.

Staffordshire, a midland county of England, bounded on the N.W. by Cheshire, on the N.E. and E. by Derbyshire and just touching Leicestershire, on the S.E. by Warwickshire, on the S. by Worcestershire, on the S.W. and W. by Shropshire. It occupies an area of 1,128 square miles. On the whole the surface is hilly, pleasantly diversified by picturesque vales, but the loftiest point (Axe Edge, on the confines of Derbyshire) is only 1,756 feet above the sea. The chief rivers are the Trent, which flows from its source in a south-easterly direction and almost divides the county into two portions, with its righthand affluents, the Sow and Tane, and its lefthand tributary, the Blythe; the Dove, bounding with Derbyshire and receiving on the right the Manyfold and Churnet, and itself at last falling into the Trent (on the left), and the Stour, a lefthand feeder of the Severn, which crosses a tiny part of the shire in the extreme south-west. The mineral wealth comprises coal (very rich in the south and in the Potteries), iron, and fireclay. The principal crops are oats, wheat, barley, potatoes, and turnips; and cattle, sheep, pigs, and horses are raised. Owing to the numerous industrial communities, dairy farming flourishes. The manufactures are varied and some famous. The Potteries district is the headquarters of the pottery trade of the world; the ales of Burton are celebrated all over the globe; and the hardware of Wolverhampton and other towns is in great demand. Stafford is the county town, but the largest towns are Wolverhampton, Burton, Hanley, Newcastle-under-Lyme, Stoke, Walsall, West Bromwich, and Wednesbury. The scenery of Dove Dale is universally admired, while the cathedral of Lichfield is one of the loveliest in the land. Amongst distinguished natives were Dr. Johnson, Izaak

Walton, Josiah Wedgwood, Mary Howitt, Lord Anson, and Cardinal Pole. The country is said to have been a centre of Druidical power and worship. In evidence of the Roman sway there yet remain Watling Street, running westwards across the shire from Tamworth, and Icknield Street, passing from Birmingham in a northerly and then north-easterly direction to Derbyshire. In Saxon times the shire formed part of the kingdom of Mercia, and at the Conquest was divided amongst William's personal friends. Mary, Queen of Scots, was imprisoned in Tutbury Castle from 1569 to 1572, and Prince Charlie in his farcical southern raid reached Leek. Pop. of administrative county (1901), 879,142.

Stag. [RED-DEER.]

Stag-Beetles, a group of beetles belonging to the family Lucanidae, and including the largest of British beetles. The name is derived from the large horns possessed by the males, which mimic in shape the antlers of the Stag. Some



STAG-BEETLE.

550 species have been described. Being wood-feeders, *par excellence*, and spending their larval stage inside the trunks of large trees, they occur abundantly only in well-wooded countries. In or near the tropics, therefore, where various kinds of trees are plentiful in the forests, they are found in great numbers and diversity. They are strong fliers, and if they dash against the face whilst on the wing will inflict a wound. The largest British species, of which there are but three, is *Lucanus cervus*, of which the males are sometimes over two inches in length. The larva is a large fleshy, wood-eating grub, and may have been the *Cossus* which was eaten by the Romans as a great delicacy.

Staghound, a strongly-built, shaggy-coated variety of the Greyhound, formerly used in Scotland to track and pull down wounded deer. With the altered conditions of sport the necessity for these dogs has ceased, and they are now chiefly kept as pets. The coat is generally yellowish-grey or iron-grey, with white on the breast. The name is also given to the large hounds used to hunt the red-deer. Sir Walter Scott's "Maida," his special favourite, was a dog of this breed.

Stagira, or **STAGEVIUS**, a town of Chalcidice (modern, Chalkis), in Macedonia, where Aristotle was born in 384 B.C. The philosopher is hence sometimes called "the Stagirite." Alexander the Great, having found the place already in decay, restored it out of regard for his teacher, but it was doomed to disappear. Its site has been fixed by some at Stavros and by others at Nizoro, with a preference for the latter, a

village on the southern face of a wooded height, commanding a view of Mount Athos and the *Ægean*, near which are immense foundations of Hellenic masonry.

Stahl, FRIEDRICH JULIUS, publicist, was born in Munich, Bavaria, on January 16th, 1802, of Jewish parents, and at the age of seventeen he became a Christian. He studied jurisprudence and in 1840 was appointed to the chair of Philosophy of Law in Berlin. He was made a life-member of the Chamber of Magnates, where as, belonging to the reactionary party, the "Junker," he became an influential leader. An opponent of political change and the champion of an unbending Lutheranism, he held that Christianity is the only sound basis either for politics or jurisprudence, a view he ably set forth in his important work, *Die Philosophie des Rechts*. His other writings include *Der Christliche Staat*, in which he appears as the advocate of the divine right of the sovereign. He consistently maintained his aversion from all liberal tendencies until his death, which took place on August 10th, 1861, at Brückenau, in Bavaria.

Stahl, GEORG ERNST, chemist, was born at Anspach, in Bavaria, on October 21st, 1660, and studied at Jena, subsequently becoming professor of medicine at Halle in 1694. His knowledge of chemistry was very great, and he made some important discoveries, establishing the phlogistic theory of chemistry, and strongly insisting on the utility of explaining all the phenomena of physical action by mere mechanical laws. He also maintained the existence of the soul. He became physician to the King of Prussia in 1716. His most valuable works are the *Theoria Medica Vera*, *Fundamenta Chymia* and *Experimenta et Observationes Chemicæ*. He died in Berlin on May 14th, 1734.

Stainer, SIR JOHN, composer and organist, was born in Southwark, London, on June 6th, 1840. He was taught the organ by his father, a schoolmaster, and when he became a chorister in St. Paul's Cathedral, in 1847, he was already a performer of remarkable promise and an accomplished reader of music. In 1854 he was appointed organist and choirmaster of St. Benedict's, Paul's Wharf, and when he left the Cathedral, in 1856, having had lessons from George Cooper and Dr. Steggall, he was appointed by Sir Frederick Gore Onseley organist of his newly-founded college at Tenbury. He matriculated at nineteen at Christ Church, Oxford, taking the degree of Mus. Bac., and became organist of Magdalen College and *informator choristarum*. In addition to these duties he entered St. Edmund Hall, working for his B.A. degree, which he took in 1863, and on the death of Stephen Elvey was appointed organist to the University. He proceeded to his Mus. Doc. in 1865, and in 1866 became M.A., leaving Oxford in 1872 to succeed Sir John Goss as organist of St. Paul's Cathedral.

Here for sixteen years, possessing the confidence of the Dean and Chapter, he wrought wonders in reforming the music, the perfection of the singing under his rule winning Gounod's admiration. Stainer, in succession to his friend Arthur Sullivan, became Principal of the National Training College and Government Inspector of Music in Training Schools, and when, through failing eyesight, he left St. Paul's in 1888, in which year he was knighted, he was elected, in 1889, Professor of Music at Oxford, where his lectures attracted large audiences. The recipient of many distinctions, "admirable and efficient musician," Sir George Grove said, "in all branches," he died suddenly while travelling at Verona on March 31st, 1901, and was buried at Oxford, universally lamented. His writings and compositions are very numerous. His works, besides anthems, hymns, and madrigals, include *Gideon*, an oratorio (1865); and the cantatas, *The Daughter of Jairus* (1878), *St. Mary Magdalen* (1883), and *The Crucifixion* (1887), the increasing popularity of which is remarkable. A fine executant; if his music has no claim to greatness, it is neither pretentious nor dull. Always fitting, it is in no instance more beautiful than in the devotional cadences of his "Sevenfold Amen."

Staines, a town of Middlesex, England, on the left bank of the Thames, 6 miles S.E. of Windsor. It is said to derive its name from the stone, standing in a meadow above the bridge, erected to mark the western boundary of the ancient jurisdiction of London City over the Thames. The stone was repaired in 1781 and mounted on a pedestal raised on three steps and bearing the names of the Lord Mayors who have visited it. A less tenable theory is that the town was named from the *milliarium*, or Roman milestone that long stood here. It was, however, the Roman station *Ad Pontes*, and Roman remains have been discovered from time to time. Staines is connected with Egham on the Surrey side by a handsome stone bridge built in 1832 and opened by William IV. and Queen Adelaide. The church of St. Mary the Virgin was built from designs by Inigo Jones in 1631, but it was practically reconstructed in 1828, and only the tower is left of the original structure. There are manufactures of linoleum and mustard, besides brewing. It is the first great angling station above tidal limits. Pop. (1901), 6,688.

Stair, JAMES DALRYMPLE, first Viscount, whose ancestors were adherents of the Reformation, only child of James Dalrymple, laird of Stair, Ayrshire, Scotland, where he was born in May, 1619. His father died in 1625, and his mother, "a woman of excellent spirit, took care to have him well educated," first at Mauchline Grammar School and afterwards at Glasgow University, where he graduated on July 26th, 1637. He served in the army in the war of the Covenant, and in 1641 was elected Regent, as a professor was then called, in Philosophy in his

University. When he married Margaret Ross, co-heiress of Balnail in Wigtown, who brought him a small estate, he resigned his office in 1643, as the statutes required, but was immediately re-elected, and remained in Glasgow until October, 1647, when he finally retired. He removed to Edinburgh, and was admitted to the Scottish bar on the following February 17th. In March, 1649, and again in March, 1650, he went as secretary to the Commissioners sent by Parliament to treat with Prince Charles as to his return to Scotland. In 1657 he was made one of the Lords of Session by Cromwell, on Monk's recommendation as "a very honest man." At heart a supporter of a limited monarchy, on the Restoration, when he visited London, he was well received by the King, who created him a baronet and appointed him one of the judges of the Court of Session on February 13th, 1661. When the independence of the judges was attacked Stair anticipated his deposition by resignation in January, 1664. He was afterwards re-admitted, and for five years longer performed his judicial duties. His daughter Janet's death, in 1669, within a month of her marriage to Dunbar, laird of Baldoon, though she had been betrothed to Lord Ruthven, gave rise to spiteful rumours and prejudices directed against Lady Stair. Whether the lady or the bride was stabbed on the wedding night can never be known. Their tragic story provided Sir Walter Scott with the plot for *The Bride of Lammermoor*. In 1670 Stair was appointed President of the Court of Session, a position he filled with credit until 1681, introducing many reforms in legal process. When the Test Act was carried he endeavoured to lessen its severity, but his moderation gave offence, and in a new commission of judges his name was omitted. He now devoted his leisure to his great work, the *Institutions of the Law of Scotland*, the first treatise on the law of his country, whose spirit is preserved in the law of the present time. He was not left unmolested. He found himself involved in fierce disputes with Claverhouse, and prudently retired to Leyden, in Holland, in October, 1682, where he afterwards published his *Physiologia Nova Experimentalis*, a treatise which Bayle favourably noticed. His enemies tried to get him expelled from Holland, but there he remained until 1688, when he accompanied William of Orange in his own ship to Torbay. Stair again became President of the Court of Session, and on May 1st, 1690, was created Viscount of Stair, Lord Glenluce and Stranraer. He had attained the summit of his fortunes, but his remaining years were filled with sorrow and factious attacks. His faithful wife, satirised as "the witch of Endor," died in 1692, and on November 25th, 1695, he died in Edinburgh, and was buried in St. Giles's Church. Sir JOHN DALRYMPLE, his eldest son, second Viscount and first Earl, was born in 1648. In 1669 he married Elizabeth, daughter and heiress of Sir James Dundas, of Newliston, West Lothian. He was admitted to the Scottish bar on February 18th,

1672, and soon distinguished himself by the eloquence which made him unrivalled in Parliament. In 1682 he came into conflict with Graham of Claverhouse, was imprisoned in Edinburgh Castle, being set free in February, 1683, on payment of a fine of £500, after making humble apology. In the next year he was again arrested, and only liberated on giving security for £5,000 within the bounds of the capital, not obtaining his entire freedom until 1686. By a change in the policy of the Court his charges were remitted; he became King's Advocate and Lord Justice Clerk on January 19th, 1688, in which year he bought the Castle Kennedy estate, now the seat of the family. Having argued that James II. had forfeited his claims to the crown of Scotland, he was one of three Commissioners sent by the Convention to offer it to William of Orange, on whose accession he became Lord Advocate, and, in 1691, Secretary of State. For several years he had the chief management of Scottish affairs, and upon his advice the King began to take active steps for settling the disturbed state of the Highlands. The Master of Stair, as Dalrymple, since his father's elevation to the peerage, had become, desired to execute some signal act of vengeance whereby the troublesome clans might be terrorised into submission. The means he took cover his memory with infamy. Pardon was offered to all who submitted before December 31st, and M'an, head of the Macdonalds of Glencoe, alone delayed until January 6th, 1692, having found no one at Fort William to tender him the oath on December 31st. Gratified by this delay, Stair planned their extirpation. "It is a great work of charity," he said, "to be exact in rooting out that damnable sect." On February 1st 120 soldiers, chosen from the Campbells, foes of the clan Macdonald, commanded by Captain Campbell, commonly called Glenlyon, from the pass in which his property lay, marched down the glen. Uncle by marriage to the old chief's second son, Glenlyon, protesting they wanted nothing but quarters, was kindly received, and with his followers lived familiarly among the clansmen. John Campbell, Earl of Breadalbane, prompted by animosity, promised to cut off the retreat of any fugitives on one side their wild glen, MacCallum More on another. Glenlyon, while daily visiting M'an, card-playing and drinking with him, and making a show of some regard for his niece, was observing every pass by which escape was possible and sending reports to Lieutenant-Colonel Hamilton, who, with 400 troops, was coming from Fort William. Hamilton appointed the morning of February 13th for the massacre. The previous evening Glenlyon supped with the unsuspecting chief, whose eldest son's suspicions had been aroused by the restlessness of the soldiers. Glenlyon quieted his fears. After a wild night, at five o'clock in the darkness of the morning the treacherous work began. The old man was foully murdered; his sons, roused from sleep by their servants, fled, and, as Hamilton failed

to arrive in time, many of the Macdonalds escaped slaughter, only to perish from exposure on the mountains. The false Glenlyon, waking or sleeping, was ever haunted with visions of Glencoe; Breadalbane was pursued with dread of retribution, and Stair, mortified at the partial failure of his plan, complacently wrote: "Can there be a more sacred duty than to rid the country of thieving? The only thing I regret is that any got away." Lord Macaulay apologises for William III., and a royal commission in 1695 found that the King's instructions "offered no warrant for the measure." Parliament voted that Stair, in his directions, had exceeded his instructions. Though his conduct brought on him no royal rebuke, Stair eventually resigned his office, and in November of the same year, on his father's death, became a peer. On Queen Anne's accession he was sworn a privy councillor and created Earl of Stair on April 8th, 1703. His activity in the debates preceding the Treaty of Union, which largely owed its success to him, hastened his death, of apoplexy, on January 8th, 1707. His services to Scotland in a time of revolution have been held to atone for the deed which tarnishes his memory. JOHN DALRYMPLE, second son of the first Earl, was born on July 20th, 1673. He accidentally shot his elder brother dead when only eight years old, and grief making the sight of the boy painful to his parents, they sent him to his grandfather, at that time exiled in Holland. He studied at the University of Leyden, and came under the notice of the Prince of Orange, who continued his friend and patron after he had become King of England. Serving in the wars against France, he became aide-de-camp to the Duke of Marlborough, was probably present at the battle of Blenheim, and distinguished himself at Venlo, Ramillies, Oudenarde, Lille, and Malplaquet. Being promoted general on January 1st, 1712, he retired to Edinburgh, became a leader of the Whigs, and engaged in intrigues to secure the Hanoverian succession. He fell in love with Eleanor, the beautiful Viscountess Primrose, the heroine of Scott's tale, *My Aunt Margaret's Mirror*, who had been cruelly treated by her first husband, and, left a widow in 1706, had resolved never to marry again. Stair was also resolute. Concealing himself in her house, he appeared at her bedroom window constraining her to save her reputation by accepting him. They were married in 1714. On the accession of George I. Stair was appointed ambassador to the French Court, 1715. Living there magnificently, he checkmated the Pretender and the intrigues of Cardinal Alberoni. His banquets were famous, the information he obtained was invaluable, and he secured the expulsion of the Pretender from Paris. He was recalled in 1720, his services being but ill-rewarded. Impoverished by his lavish expenditure, he sought to repair his fortunes by attention to agriculture, while his lady became a leader of Society in Edinburgh. On Sir Robert Walpole's fall Stair was

made a field-marshal (1742) and governor of Minorca, with leave not to reside there. After the victory of Dettingen, where he again greatly distinguished himself, he resigned his command, but when a Jacobite rising was anticipated in 1744 he offered his services, and was made Commander-in-Chief of all the forces in South Britain. He died on May 9th, 1747, at Edinburgh, his wife surviving him for twelve years.

Stalactite and Stalagmite, the names arbitrarily applied respectively to icicle-like mineral deposits formed by the evaporation of



STALACTITE AND STALAGMITE.

a dripping solution, and to crystalline deposits of similar origin in layers on a more level surface below. Various minerals occur in a stalactitic form, such as chalcodony, iron-pyrites, and baryte, whilst kidney-iron and malachite are practically stalagmitic; but the most familiar example of the process is in the rows of stalactites of calcite that mark lines of joint on the roofs of limestone caverns and the layers of the same composition on their floors. As each drop gathers on the roof and begins to evaporate and lose carbonic acid, the excess of carbonate which it can no longer retain is deposited round its edges as a ring. Drop succeeding drop lengthens the original ring into a long pendent tube, which, by subsequent deposit outside, becomes thickened and may, after reaching the floor, be indefinitely increased in diameter. At first the calcareous deposit is soft; but it becomes crystalline, fibrous crystals radiating outwards from the central tube. The further evaporation of the water which drips on to a comparatively level floor forms the more distinctly crystalline stalagmite, which rises from its regular layers into ridges and pinnacles under the rows of stalactites. The rate at which the deposits take place depends upon rainfall, porosity, etc., and cannot be used as a safe measure of time.

Stall, one of a range of seats constructed against the sides and screen of a cathedral choir or of a college chapel, generally having side partitions, and often an elaborately carved canopy and miserere. The term is used to designate the dignity of a canon.—In the theatre a chair or partitioned seat; now one of the seats occupying in most cases the floor of the house. In theatres that still maintain the pit, or

parterre, this is usually placed behind the stalls. At one time, however, the pit covered the whole floor, being filled by the most critical part of the audience, who could make or mar a play; but in those days the stalls were either unknown or were confined to a few rows of armed chairs or seats in front.

Stalybridge, a town situated on the borders of Lancashire and Cheshire, England, on the Tame, 7½ miles E. of Manchester. It rose into importance at the end of the 18th century as the site of the first cotton-mill, steam-power, too, being first used here for spinning and weaving. It now possesses large factories for cotton and woollen goods, iron and brass wares, and nails. The principal buildings are the town hall, mechanics' institute, market hall, and infirmary. In Stamford Park, a public recreation ground, stands a fine Elizabethan mansion, formerly called Highfield House, which has been converted to the purposes of a museum and library. Pop. (1901), 27,674.

Stamboul. [CONSTANTINOPLE.]

Stamen, the male sporophyll of a flowering plant, consisting typically of the usually thread-like filament surmounted by the anther, which contains the pollen. In its earliest stages, in almost all cases, a stamen closely resembles a foliage-leaf. As it develops there is generally a central bundle of spiral vessels, or midrib, and certain hypodermal cells (archesporium) give rise to the pollen-sacs (sporangia), which are generally four, though afterwards merged into two chambers (loculi). In them originate the pollen-mother-cells. The two outer layers of cells in the anther become specially modified, the outer into a slightly cuticularised epidermis or exothecium, the inner, or endothecium, into a layer of spirally-thickened cells interrupted in the region at which the anther splits when ripe. The central portion of the stamen between the pollen-sacs is termed the connective. It is usually small, but in the violet it is produced into a triangular buff-tip, and in two of the central stamens is also appendiculate, being furnished with a tail-like nectariferous appendage at the base of each, which is enclosed in the spear of the corolla. In heaths there are two similar processes, non-nectariferous, at the base of each anther. In the hornbeam the connective bifurcates, each branch bearing an anther-lobe or dimidiate (i.e., halved) anther, whilst in the sage (*Salvia*) the connective is a long, unequal-armed lever, with an anther-lobe at each end, the lower one abortive. When the connective is thus enlarged the anther is termed distractile. If the filament be absent, the anther is sessile; whilst if the more essential anther be absent, the stamen or filament is abortive or sterile, and is commonly termed a staminode.

The stamens may be described with reference to their (1) number, (2) relative length, (3) union or cohesion, (4) insertion or adhesion, (5) form of filament and anther and the mode of insertion of the latter on the former, and (6)

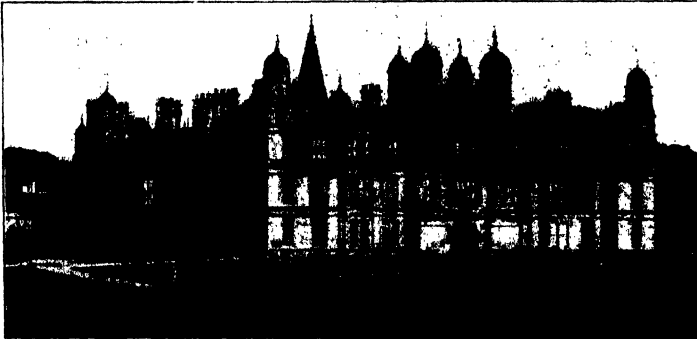
mode of dehiscence of anther. The number of stamens in a flower may vary from one to twelve, twenty, or more, and the first eleven classes of the artificial system of classification proposed by Linnæus are named according to this character. The stamens are commonly equal in length, but sometimes of various lengths, according to their order of development; and if they are in more than one whorl, those of one whorl are often longer than those of another, as in the purple loosestrife. In the special cases of four stamens, two long and two short, characteristic of most Labiata and Scrophulariaceæ, and of six stamens, four long and two short, as in Cruciferae, they are known as didynamous and tetradynamous respectively. The stamens may either be free, as in all the Linnæan classes as yet referred to, or they may be united by their filaments, by their anthers, or by both. Some of the cases of apparent union by the filaments are truly due to branching (chorisis). Intercalary growth of a zone of tissue below all the stamens carrying them up on a tube, as if all united by the lower part of their filaments, as in Malvaceæ, geranium, furze, broom, etc., produces what is called the monadelphous condition. Most Leguminosæ have ten stamens, nine united and one free. This is termed diadelphous, whilst the branching of three or more stamens produces the condition known as polyadelphous. The Compositæ are the most important case of the union of stamens by their anthers, which Linnæus styled syngenesious, and the Cucurbitaceæ illustrate union by both filaments and anthers. The insertion or adhesion of the stamens can usually be described by the same terms as that of the corolla—namely, hypogynous, perigynous, or epigynous; but in gamopetalous (or gamophyllous) flowers, owing to intercalary growth beneath both the corolline and the staminal whorl, they often appear to spring from the petals, corolla-tube (or perianth), and then are termed, in addition to being hypogynous or epigynous,



STAMENS.

as the corolla may happen to be, epipetalous (or epiphylous), as in the primroses, lilac, etc. In orchids and a few other plants the stamens are adherent to the gynoecium, forming a column or gynostemium, and the flower is then termed gynandrous. Though commonly thread-like or filiform, the filament is sometimes, as in grasses, so slender, hair-like, or capillary as to bend under the weight of the anther. In other cases it is broader at the base, tapering like an awl or subulate, or it may be broad and petaloid. The anther is sometimes attached to the filament or to its direct continuation, the connective, throughout its whole length, as in water-lilies, violets, etc., when it is termed dorsifixed or adnate. In other cases it is articulated at its base to the apex of the filament, and is called basifixed or innate, as in sedges (*Carex*); or, again, it may be only attached by a point about the middle of its back so that it can turn freely

as on a ball-and-socket joint, and is therefore called versatile, as in grasses and lilies. In *Salvia* the long connective is attached in this way to a short stout filament, on which it swings like the ancient quintain. To discharge its pollen when ripe, the anther generally splits or dehisces longitudinally, by a slit down the face of each lobe, as in lilies, grasses, violets, etc. When short and rounded, it sometimes dehisces transversely by a horizontal split, as in *Alchemilla*. In the heath family (*Ericaceæ*) dehiscence is porous, by a hole at the top of each lobe, the lobes in some genera, such as the cranberries, being produced upwards into tubular processes. In the barberry and in the bay-tree dehiscence is opercular or valvular, two parallel splits and one transverse one on the face of each lobe forming a little door or operculum, which folds back in an upward direction. Dehiscence is often an important classificatory character, and from this point of view we must



BURGHLEY HOUSE, STAMFORD.
(Photo: Mrs. G. A. Nicol, Stamford.)

observe not only the mode, but also the direction in which it takes place. In *Compositæ*, *Amaryllidaceæ*, and *Liliaceæ* the anthers burst towards the centre of the flower, and are termed introrse; in *Berberis*, *Iridaceæ*, and *Colchicaceæ* they burst outwards—i.e., towards the perianth—and are called extrorse.

Stamford, a town on both sides of the Welland, mainly in Lincolnshire, but partly in Northamptonshire, and not far from the border of Rutland, England, 12½ miles N.W. of Peterborough. It appears in history soon after the Roman period, and was one of the five Danish boroughs. In the 13th and 14th centuries it almost rivalled Oxford and Cambridge as a seat of education. It returned a member to Parliament under Edward III., and was incorporated under Edward IV. It has always been a town of churches, and still comprises six parishes, all, save one, in Lincolnshire. St. Mary's, reputed to be the mother church, is in the Early English, Decorated and Perpendicular styles; All Saints' is Early English and Perpendicular; St. John

the Baptist's is chiefly Perpendicular, and contains much beautiful old glass in its windows; St. George's is Early English, Decorated and Perpendicular, and also has some ancient glass; and St. Michael's is Early English. St. Martin's, Stamford Baron, in the Northamptonshire part of the borough, is Perpendicular, has a large amount of old glass, and contains a splendid mausoleum of the Burghley family. Daniel Lambert (1770-1809), the noted fat man, was buried in its churchyard. He died at the "Waggon and Horses" inn, and his coffin, which comprised 112 superficial feet of elm, was placed on two axle-trees and four wheels, on which it was rolled down a gradual incline to the burial-ground. The principal buildings include the town hall, corn exchange, literary and scientific institution (with library and museum), high school, Truesdale's almshouses (founded in 1770 by Thomas Truesdale, and rebuilt in 1833), Snowden's almshouses (1604), and Browne's hospital (founded by William Browne, and completed in 1493), the chapel of which has a four-light window of fine ancient glass. There are agricultural implement and machine factories, breweries, and works for the building of carts and road waggons. Burghley House—the "Burleigh House by Stamford town" of Tennyson's ballad, "The Lord of Burleigh"—standing in a noble park, was built in 1575. Pop. (1901), 8,229.

Stamford Bridge, a town of the East Riding of Yorkshire, England, on the left bank of the

Derwent, 8 miles E.N.E. of York. It is memorable as the field of the battle of Stamford Bridge, when, on September 25th, 1066, Harold II. defeated his traitorous brother Tostig and his ally, Harold Hardrada, the Norwegian king, both of whom were slain. It proved a fatal victory for Harold, however, for whilst he was engaged in the North repelling this attack, William the Norman—for whose arrival he had waited vainly for several weeks before—effected an undisputed landing at Pevensey on September 29th. The battle of Hastings speedily followed, with the Conquest in its wake. Had Harold been free to confront the invader, the landing, in all likelihood, would have been impracticable. In such case what would have been the course of English history?

Stammering. This defect of speech is characterised by lack of co-ordination in the muscular movements of inspiration or expiration, or in those of the glottis or of the lips and tongue. The complex series of ordered mus-

ilar movements concerned in the production of speech is, in the person who stammers, deranged and thrown out of gear by the involvement of one or other of the muscles in a condition of spasm. Stammering is usually first met with in early childhood. It often becomes worse up to the period of puberty, and then frequently improves. Nine-tenths of the sufferers are males. It is sometimes hereditary, and is occasionally met with in persons who belong to families with a history of nervous disorders. Something can be done to remedy the condition by insisting on slow and deliberate speech. In some cases considerable improvement has resulted from the practice of intoning in speaking, it being a well-established fact that stammering almost invariably disappears during the act of singing. In many cases, however, although improvement may occur, it is impossible to effect an absolute cure.

Stamp Act, THE, the high-handed piece of legislation that was largely responsible for the loss of her American Colonies to Great Britain. In 1764 George Grenville, the Chancellor of the Exchequer (who was also Premier), proposed to impose customs duties on articles imported into the Colonies. His proposal was carried, as well as a vague resolution asserting that "it may be proper to charge certain stamp duties in the said Colonies and Plantations." This Act declared practically the right of the Mother Country to impose taxation, and was in obvious violation of the fundamental principle that taxation and representation should go together. In spite of the protests of the Colonies, the Act was enforced (1765) after a year's interval. The Colonists, however, resisted its execution, and their discontent grew so marked that Parliament could no longer ignore it. William Pitt (afterwards the 1st Earl of Chatham), who had been prevented by illness from taking part in the earlier debates, now urged that, since the taxation was illegal, it should be repealed, but that a clause might be passed maintaining the general legislative authority of Parliament over the Colonies. The taxation was repealed (1766), but without such a clause as Pitt had suggested, and the original resolution therefore still remained. This was naturally regarded as a sword of Damocles, that might descend at any moment upon their heads, and, though hostile sentiment was temporarily appeased, the Colonists' dissatisfaction merely smouldered, to break out, a few years later, into unquenchable flame.

Stamp Collecting. [PHILATELY.]

Stamps, authoritative impressions made on papers or parchments used for official or business purposes for which fees or duties are charged by Government, the specified instruments being invalid unless stamped. Stamps are also purchased from Government for affixing to postal packages (as payment for carriage and delivery) and documents liable to duty, such as receipts and agreements.

Standard, BATTLE OF THE, was fought near Northallerton, in Yorkshire, on August 22nd, 1138, when the Scots, under David I., sustained a severe defeat at the hands of the English. The King had entered England ostensibly in support of the Empress Maud against Stephen, but the people of the Northern shires had suffered so frequently in Border raids that they suspected his good faith and determined to dispute the advance of the Scots. Under Raoul, Bishop of Durham, an army was enrolled, and, to give it good heart, the consecrated banners of St. Cuthbert of Durham, St. Peter of York, St. John of Beverley, and St. Wilfrid of Ripon were sent to the force. These were hung from a pole, surmounted by a cross, in the centre of which was a silver casket containing the consecrated wafer of the Holy Sacrament. The pole was then fastened into a four-wheeled car, upon which the Bishop stood whilst the conflict went forwards. Under the influence of religious enthusiasm the English onset proved irresistible.

Standard of Time. In order to have a standard of time we must have a perfectly trustworthy and uniform motion as a means of measurement. The rotation of the earth on its axis is uniform and constant; hence equal intervals of time occur between any two successive passages of a fixed star across the meridian. If we divide the time between such passages into twenty-four hours, we shall obtain the sidereal hour; but this is by no means convenient in ordinary life. It is convenient in obtaining certain astronomical measurements, and a sidereal clock is to be found in every observatory; but a certain hour on that clock—say 8 o'clock—may mean any time during the night or day, according to the time of year, and hence would be practically useless to people generally. On the other hand, the period between two successive passages of the sun across the meridian—a solar day—is far more convenient, and, if the sun travelled uniformly round the equator, it would be a perfectly simple thing to obtain the value of a solar hour. [TIME.] The sun, however, does not behave in this way; it moves in the ecliptic instead of the equator, and its motion is irregular. An imaginary sun is, however, supposed to move under these simple conditions and to perform its complete journey in the same time as the real sun; it, in fact, takes an average of the sun's motions, and the day obtained in this way is known as a mean solar day. A clock which neither loses nor gains is regulated to this mean time, while observations on the sun itself would give apparent time. The correction which should be applied to the apparent time to convert it into mean time is known as the Equation of Time, and is never greater than 16' 18".

Standing Stones, a general name for unhewn monoliths. When occurring singly they are called Menhirs; and if disposed in a ring, Stone Circles. The Standing Stones of the British Isles and of the Continent are pre-

historic, and commemorate some event, as a battle, or mark a burial-place, the latter having in many cases been discovered by excavation. The Standing Stones of Scotland probably mark interments of the Bronze Age; those of Norway belong to the Iron Age. In the North-East of India Standing Stones are still used as sepulchral monuments and as offerings to ancestral spirits. Near Stennes, in the island of Pomona, in the Orkneys, are found two groups of Standing Stones. The smaller, which contained the larger stones, originally consisted of 12 stones, the tallest 18 feet high, but only three are extant, the longest prostrate, the other two erect. The bigger group formerly comprised 60 stones, of which 15 are still standing and there are remnants of 22 others. The Stone of Odin, familiar to readers of Sir Walter Scott's *Pirate*, is an interesting relic in this locality. It is pierced with a circular hole, through which the lover and his lass clasped hands and plighted their troth. At Callernish, some 16 miles west of Stornoway, in the Lewis island of the Outer Hebrides, is a remarkable arrangement of blocks of undressed gneiss, averaging 12 feet in height. The inner circle is approached by avenues of Standing Stones on the north, south, east and west, and there seems no reason to doubt but that this was a cruciform sun-temple. The plan taking the form of a cross is certainly noteworthy. Still more extraordinary is the enormous assemblage of stones found in the Morbihan district of Brittany, in France. They occur especially in the vicinity of Carnac which takes its name from the cairn of Mont St. Michel, just outside the town) and Locmariquer ("the place of the Virgin Mary"). T. Cato Worsfold, in his scholarly book, *The French Stonehenge*, estimates their number at from 6,000 to 7,000. The majority are erect, but many have been overthrown, probably by seismic or other natural disturbance. Some were of vast dimensions, the prostrate Giant Menhir at Locmariquer measuring 78 feet in height, 13 feet at the base, and weighing at least 240 tons. Worsfold classifies this great array of stones into (1) Menhirs, or single stones, called also Maensaas, or Poulvans (when disposed in circles they are known as Cromlechs); (2) Dolmens, a flat stone, supported tablewise on two or three upright stones; and (3) Alignments, or lines of Menhirs set up in regular rows. Found in the Orkneys, the Outer Hebrides, Great Britain, Scandinavia, and Brittany—an area which may be comprehensively described as North-Western Europe—it is clear that this wide distribution forbids the theory that they were merely local features. Their age and the extensive area of their occurrence therefore support the belief that they subserved a purpose common to the early primitive people who occupied these regions in the prehistoric period. A common purpose plainly indicates either a burying-ground or religious usage, or, in all likelihood, both, as the object with which these Herculean structures were raised.

Standish, MYLES, was probably born in 1584, at Duxbury, Lancashire. After serving in the Netherlands under Veres, he joined the Puritan colony settled at Leyden, although he never became a member of their communion. With the Pilgrim Fathers he sailed in the *Mayflower*, on September 6th, 1620, for America, his military experience fitting him to act as adviser to the little band. He was entrusted with the command of the exploring parties, who were exposed to great risks from the Indians. The site they chose for their settlement they named New Plymouth. During the first winter sickness carried off many of the colonists, including Standish's wife, Rose. The story of his second courtship as told by Longfellow has only a traditional basis. His second wife, Barbara, thought to have been a younger sister of Rose, went over to New Plymouth in 1623, and by her he had four sons and a daughter. Appointed military captain of a force numbering only 32 men, his ability was equal to the dangers of his post. He surprised a hostile Indian encampment and rescued a friendly native who had acted as interpreter, and, subsequently, established amicable relations with the neighbouring tribes. In 1621 his force was happily increased by a fresh arrival of colonists. A second settlement was founded in 1622 at Wessagussett, which aroused the hatred of the Indians by the treachery and profligacy of the inhabitants. Warned of a plot to exterminate all the settlers, Standish, with eight men, went to Wessagussett, now called Weymouth, and invited the chiefs to a conference. When they had entered the room the door was shut and the unfortunate Indians were killed. Their followers were defeated, and by this prompt action the colonists were saved and became feared and respected. Disputes with the London merchants who had provided means for the enterprise brought Standish home, and he eventually succeeded in satisfying their claims. Independent adventurers troubled the settlers, but they prospered notwithstanding, and from 1644 to 1649 he was treasurer to the colony. Standish died at Duxbury, Massachusetts, his estate on the north side of Plymouth Bay, on October 3rd, 1656. The house built by his son Alexander is still in the possession of his descendants. On Captain's Hill, near by, in 1872 a granite shaft, surmounted by a bronze figure, was raised to his memory.

Stanfield, CLARKSON, painter, was born at Sunderland, England, on December 3rd, 1793. He went to sea in 1808; was pressed into the Navy in 1812, and left it in 1818. During his service his love for drawing and amazing dexterity were often requisitioned for the scenery for private theatricals and decorations. He soon found employment as a scene-painter after giving up seafaring, and in 1821 went to the Theatre Royal, Edinburgh, where he became friendly with David Roberts. From 1822 to 1834 he was almost constantly engaged at

Drury Lane, where he acquired a great reputation. He had meanwhile grown noted as an easel-painter, and after the latter year devoted himself almost exclusively to this branch of art. But now and again he painted scenery for friends, such as the diorama for Macready's Covent Garden pantomime in 1837, the drop-scene for Charles Dickens's *Frozen Deep*, the scenery for Macready's pantomime of *Acis and Galatea* at Drury Lane in 1842, and the drop-scene for the second Adelphi Theatre for Benjamin Webster in 1858. In 1832 he was elected an Associate of the Royal Academy, and three years later was promoted to full membership. He died at Hampstead, London, on March 18th, 1867. Among his best-known pictures are "Isola Bella" (1834), "The Battle of Trafalgar" (1836), "Squally Day on the Scheldt" (1837), "Tilbury Fort—Wind against Tide" (1849), "The Battle of Roveredo" (1851), "The Victory towed into Gibraltar after Trafalgar" (1853), "The Pic du Midi" (1854), and "The Abandoned" (1854). At the Paris Exposition of 1855 he was awarded a gold medal of the first class. If he looked at Nature with the eye of a scene-painter, and if, consequently, his pictures lack imagination and poetry, he was yet a brilliant draughtsman, an excellent though rather cold colourist, and in composition simply superb. He illustrated many books, and his work bore translation into black and white uncommonly well. As a man he was beloved by all who knew him.

Stanford, SIR CHARLES VILLIERS, composer, was born at Dublin on September 30th, 1852. He was educated privately and at Queens' College and Trinity College, Cambridge, and studied composition under Karl Reinecke, at Leipzig, and counterpoint under Friedrich Kiel, at Berlin. From 1872 to 1893 he was organist to Trinity College, Cambridge, and conductor of Cambridge University Musical Society. In 1887 he was appointed to the Professorship of Music at Cambridge, and also holds the chair of Composition and Orchestral Playing in the Royal College of Music (1883). He has published much excellent music, among which may be noted his operas *The Veiled Prophet* (1881), *The Canterbury Pilgrims* (1884), *Shamus O'Brien* (1896), and *Much Ado about Nothing* (1901). For musical festivals he produced, among other works, *The Three Holy Children* (Birmingham, 1885), *The Revenge* (Leeds, 1886), *The Battle of the Baltic* (Hereford, 1891), *The Bard* (Cardiff, 1895), *Te Deum* (Leeds, 1898), *The Last Post* (Hereford, 1900), and *Songs of the Sea* (Leeds, 1904). His choral works include *The Resurrection* (Cambridge, 1875), *Carmen Seculare* (Jubilee Ode, 1887), *East to West* (London, 1893), and *Mass in G* (Brompton Oratory, 1893). He has also composed several instrumental pieces, and many of his songs have won widespread popularity. He was knighted in 1902.

Stanford, LELAND, railway constructor, was born at Watersvliet, New York, on March 9th,

1824. In 1856 he settled in San Francisco and became Governor of California, and in 1885 was elected a senator of the United States. He became president of the Central Pacific Railway, the making of which he had urged, and superintended its construction. Out of his great fortune he devoted \$26,000,000 to found the Leland Stanford Junior University, at Palo Alto, south of the city, in memory of his son. It was opened in 1891. Pupils are boarded on the premises at the smallest charges practicable; the education is freely provided from the Kindergarten stage to the most advanced studies, and telegraphy, type-setting, farming, and journalism are specially taught. The instruction is co-educational, and the female students number about one-third of the whole. The munificent donor died at Palo Alto on June 20th, 1893.

Stanhope, CHARLES, 3RD EARL STANHOPE, politician and inventor, was born in London on August 3rd, 1753, and educated at Eton and (privately) at Geneva. From an early age he disclosed a remarkable gift for mechanical skill, and he was elected F.R.S. in 1772. Among the discoveries and inventions with which his name is associated were patents for the propulsion of vessels by steam engines (1790, 1807); a process of stereotyping, acquired by the Clarendon Press, at Oxford, in 1805; the iron hand-press, still known by his name; two calculating machines and the microscopic lens that bears his name. Owing to the death of his elder brother, in 1763, he became heir to the title at the age of ten, and succeeded the second Earl in 1786. In politics he was an ardent and consistent Radical, and was for a few years a warm friend of William Pitt, whose sister, Lady Hester, was his first wife. He parted with Pitt over the French Revolution, of which he was so active a supporter that, in 1794 and again in 1795, he brought forward in the House of Lords a resolution protesting against any interference with the internal affairs of France. On the first occasion the peers expunged the entry from their journals, on the second he found no seconder. A medal was struck in his honour, with the motto, "The minority of one, 1795," and he was known for a period as "Citizen" Stanhope. After a life of incessant activity in science and politics, he died at Chevening, in Kent, on December 15th, 1816.

Stanhope, LADY HESTER LUCY, eldest daughter of the 3rd Earl Stanhope and his first wife, Hester, sister of William Pitt, was born at Chevening, Kent, on March 12th, 1776. Home proving uncongenial, she went to live with her grandmother at Burton Pynsent from 1800 to 1803. Having attracted her uncle's attention, he invited her to keep his house in August of the latter year. She ruled it imperiously, his admired confidante. "If she were resolved to cheat the Devil," Pitt said, "she could do it." But her reign was short. Pitt's death, in January, 1806, extinguished her aspirations, and a

pension from the country was a poor compensation for the eclipse of her public career. The death of a favourite brother and of Sir John Moore, whom she loved, at Corunna, in 1809, increased her distress, and after a short retirement in Wales she left England, in 1810, never to return. Accompanied by a faithful companion, Miss Williams, who died in 1828, and by Charles Lewis Meryon, a physician, after many wanderings and shipwreck, she settled among the half-savage tribes of Mount Lebanon. The Pasha of Acre ceded to her a ruined convent and the village of Dahar-June, situated on a conical hill eight miles from Sidon. Here she built a group of houses, surrounded by gardens and a wall, fortress-like. The natives came to have a superstitious respect for the strange lady. She adopted the dress of a Mohammedan chief, with weapons and pipe. She smoked, kept a horde of cats and other animals, and with frequent blows from a mace and vigorous language ruled her thirty Eastern attendants. Often intriguing against the British Consuls and in straits for money through prodigality, disappointment intensified her masterful temper and tyrannical disposition. An English traveller advised her to return home. "When a horde of plunderers was breaking in at my gate I sallied out among them, sword in hand, and having convinced them that they could not hurt me if they would, I fed them, and they behaved like thankful beggars. Here I am destined to remain." Such was her spirited reply, and worn out by vexation and sorrow she died on June 23rd, 1839, with no European near, her servants plundering her rooms, leaving only the ornaments she wore. Hearing she was ill, the British Consul at Beyrout, Niven Moore, considerably came with the American missionary, William McClure Thomson, author of *The Land and the Book*. They arrived just after her death, and found her residence, "hemmed in by arid mountains," deserted. At midnight, by torchlight, they carried the body, in a plain deal box, covered with the flag of her country, into the garden and buried her in silence. Her only fellow-countryman present was named Moore, who remarked upon the coincidence of her funeral with that of the man she had loved, buried "darkly at dead of night." This was the end of the once gay and brilliant niece of Pitt, who had been familiar with the intrigues of kings and cabinets. Kinglake gave a striking picture of her in *Eothen*.

Stanhope, JAMES, 1ST EARL STANHOPE, soldier and statesman, was born in Paris in 1673, and educated at Eton and Trinity College, Oxford. He joined the army and, having served brilliantly at the siege of Namur in 1695, was made a colonel. He had a distinguished career in the army, was present at the siege of Barcelona, and subdued Minorca, and gained several successful battles in the Peninsula, although his military career in Spain closed with the reverse at Brihuega (1710), which ended in his

imprisonment for fully eighteen months at Saragossa. He afterwards entered political life, and in 1714 became Secretary of State, and Prime Minister in 1717, an office which he only held three months, finding the Chancellorship of the Exchequer wholly unsuitable to his tastes and experience. He was raised to the peerage in 1717 as Baron Stanhope of Elvaston and Viscount Stanhope of Port Mahon (in commemoration of his capture of that town in Minorca), and was created Earl Stanhope in the following year. He died in London on February 5th, 1721. He married an aunt of William Pitt, the illustrious Earl of Chatham.

Stanhope, PHILIP HENRY, 5TH EARL STANHOPE, statesman and historian, was born at Walmer, Kent, on January 30th, 1805, and was educated privately and at Christ Church, Oxford. Embarking upon a political career, he entered the House of Commons in 1830, and in 1834, during Sir Robert Peel's first and short-lived Government, became Under-Secretary for Foreign Affairs, but after the death of his father (1855) and his consequent removal to the House of Lords, he ceased to take a very prominent part in political affairs, and devoted himself to historical studies. Previously he had made, as Lord Mahon, a reputation by his *History of the War of the Succession in Spain, 1702-1711* (1832), and maintained it by other works, the most important of which were *The History of England from the Peace of Utrecht to the Peace of Versailles, 1713-1783* (1836-53); *The Life of the Right Honourable William Pitt* (1861-2); and *The History of England, comprising the Reign of Queen Anne until the Peace of Utrecht* (1870). He rendered memorable service both to letters and art. Along with Lord Macaulay he was responsible for the Copyright Act (1842), was practically the founder of the National Portrait Gallery (approved, 1856; housed temporarily in Great George Street, Westminster, 1859; removed to South Kensington, 1869; transferred to Bethnal Green, 1885; permanently quartered at Trafalgar Square, 1896), and was the instigator (1869) of the Historical Manuscripts Commission. He died at Bournemouth on December 24th, 1875.

Stanley, ARTHUR PENRHYN, Dean of Westminster, was born at Alderley, in Cheshire, on December 13th, 1815. His father, rector of that place, afterwards became Bishop of Norwich, and his uncle was the 1st Lord Stanley of Alderley. He was first educated at a private school in Seaforth, and was sent in 1829 to Rugby, where he fell completely under the spell of Dr. Thomas Arnold, an influence which remained with him to the end. After a career of very great distinction at Balliol College, Oxford, he took orders, and in 1838 became a fellow of University College, of which he was tutor for twelve years. In 1844 he published his *Life and Correspondence of Dr. Arnold*, and in the following year was appointed select preacher to the University. His *Memoir of Bishop Stanley* came out in 1850, and in 1851 he was made Canon

of Canterbury, a cathedral and city which he celebrated in his *Memorials of Canterbury* (1854). A lengthened tour in the East led to the publication in 1856 of one of his most popular books, *Sinai and Palestine*. In 1856 he was appointed to the professorship of ecclesiastical history at Oxford, and there being a canonry at Christ Church attached to the chair, his removal from Canterbury was necessary. He was not a theologian in the higher sense—he had neither the scholarship nor the critical acumen—but among his more purely theological works may be named the *Commentary on the Epistles to the Corinthians* (1855), *Lectures on the Eastern Church* (1861), *Lectures on the Jewish Church* (three series, 1863-76), *The Athanasian Creed* (1871), and *Lectures on the Church of Scotland* (1872). In 1862 he went to the East with the Prince of Wales, and in 1863 became Dean of Westminster, in which year he also married Lady Augusta Bruce. Her death in 1876 affected him greatly and hastened his own on July 18th, 1881. He was buried beside his wife in the old Abbey which he loved so well and of which he wrote an account in his *Memorials of Westminster Abbey* (1868). He was an admirable writer and a fearless Broad Churchman, raising some opposition by his pronounced views. He was, however, deeply respected by friends and opponents.

Stanley, SIR HENRY MORTON, African explorer, whose real name was JOHN ROWLANDS, was born at Denbigh, in Wales, in 1840. He was deserted in childhood, and began life as a cabin-boy at the age of fifteen, voyaging to New Orleans. He joined the Confederate army in the Civil War, but afterwards served in the Federal navy. In 1867 he was sent by the *New York Herald* to describe the British expedition to Abyssinia, and the same paper sent him in 1871 to search for Dr. Livingstone in the heart of Africa. On November 10th he met the illustrious traveller, and was enabled to prove also that Lake Tanganyika was not connected with the Nile system. In 1872 his book, *How I Found Livingstone*, appeared. He represented the *New York Herald* during the Ashantee War, and published *Coomassie and Magdala* in 1874, after which a second journey to Africa was undertaken, at the cost conjointly of the *New York Herald* and the *Daily Telegraph* (of London). As one result of this enterprise, Stanley established the identity of the Lualaba with the Congo. The expedition was described in his *Through the Dark Continent* (1878). In the following year he returned to the continent—no longer, largely through his labours, to be described as Dark—and, helped by the King of the Belgians, founded, despite many difficulties, the Congo Free State in 1884. Another feat was his expedition in 1887 to find Emin Pasha, the naturalist, although it never clearly appeared that Emin, any more than Livingstone, was really "lost." In June, 1890, he married Dorothy Tennant, the artist, in Westminster Abbey, becoming, a year or two after his

marriage, a naturalised British subject. In *Darkest Africa* appeared in 1890. In 1895 he was elected M.P. for North Lambeth, and was made G.C.B. in 1899. He retired from Parliament in 1900 owing to ill-health, and died in London on May 10th, 1904.

Stanley, THOMAS, poet and scholar, only son of Sir Thomas Stanley, was born at Cumberlow, Hertfordshire, in 1625. He entered Pembroke Hall, Cambridge, on June 22nd, 1639, and graduated M.A. in 1641. His early marriage with Dorothy, daughter and co-heiress of Sir John Enyon, was not allowed to hinder his studies, and after many years of foreign travel he settled in lodgings in the Middle Temple. Occupied with literary work and friendships, his ample means enabled him to befriend necessitous authors, James Shirley, the dramatist, among others. Nephew of William Hammond and cousin of Richard Lovelace, the poets, who each wrote verses in honour of his wedding, his own poetical gifts appeared in his first volume, *Poems*, dedicated to Love (1647). It included translations from Tasso, Lope de Vega, and Petrarch, and a poem which is interesting from being in the metre Tennyson made familiar in *In Memoriam*. Other volumes of verse followed. On the suggestion of his uncle, Sir John Marsham, the chronologer, he began the study of Greek philosophy, which resulted in his important *History of Philosophy* in four volumes (1655-62). It comprises a series of biographies, beginning with Thales, mainly based on Diogenes Laertius, and was long regarded as a standard work, and was translated into French and Latin. In 1663 his edition of the text of Æschylus, with a Latin translation and notes, appeared, and was recognised as superior to any of its predecessors. He has been charged with plagiarism, but his work is esteemed "a great monument of critical learning." Pope, who was not a generous critic, always spoke of his scholarship with respect. He died on April 12th, 1678, and was buried in the church of St. Martin's-in-the-Fields, London.

Stannary, a district in which mines of tin (Latin, *stannum*) are situated. At an early period in English history a court called the Stannary Court was established in Cornwall for the purpose of regulating the affairs of the tin mines and the miners.

Stannic Acids. Two compounds, in which an oxide of tin acts the part of an acid, are known: (1) stannic, and (2) metastannic acid. The first may be obtained as a gelatinous precipitate by the addition of an acid to one of its salts—stannates. Of these salts sodium stannate is very largely employed in calico-printing; it is obtained by boiling caustic soda with dioxide of tin, and has the formula $\text{Na}_2\text{SnO}_3 \cdot 3\text{H}_2\text{O}$.

Stannic and Stannous Salts. [TIN.]

Staple Inn, the finest example of Elizabethan architecture in London, stands on the southern side of Holborn, near the western confines of

the City proper. It has undergone curious vicissitudes of fortune, and its origin carries us back to the 13th century, when the Society of the Merchants of the Staple was constituted. This association was incorporated in 1319 under the style of the Mayor and Constables of the Staple of England. The staple in question was wool. English wool was always of prime importance, in token whereof a wool sack ultimately became the official seat of the Lord Chancellor. The Staple house was originally established in Westminster, but in 1375 it was removed to Holborn, where, however, the merchants did not settle down, and in 1378 returned to their old quarters. In that year the buildings they had erected in Holborn were converted to the uses of an inn of Chancery, under the designation of Staple Inn, a name

to be one of the finest of its kind in London." The clock itself beneath is of ancient date, except as to the two faces, which are relatively modern, having been set up in place of more ancient dials about 120 years ago. This was due to the hands on the previous dials coming to a deadlock at the figures 8 and 6, which coincidence forthwith evoked the following rhyming gibe at the lawyers:

The Ancients' ancient clock was stopped,
Stopped by the hand of Fate;
The fingers stood (of course they would),
Stuck fast at "six and eight."

The most curious feature of the oaken roof of the hall are the upright wooden ornaments supported on the lower short beams of the spandrels, figures which have been likened derisively to Polynesian fetishes and which Cato Worsfold

says that many acquainted with New Zealand have declared were actually carved by Maoris. But if we accept 1581 as the date of the hall, it is obvious that these "ornaments" are an accretion of much later date. Though the appearance of the whole neighbourhood and the character of the environment of the buildings themselves have in time grown entirely changed, it is still possible to agree with Sir George Buc who, in 1615, described the Inn as "the fayrest inne of Chancerie." Even in its heyday, however, the Inn was never more than an institution at which students took the earlier stages of their legal curriculum, attending lectures for a couple of years or so before passing on to the Inn of Court at which they desired to be called. It was at one



[Photo]

STAPLE INN.

[Pictorial Agency.]

they have borne ever since. The lawyers were not unmindful of the origin of the place, and adopted as their arms, or insignia, a wool pack *argent* on a field *vert*, a device that may be seen in a stained-glass panel of the oriel window of the hall and over the door of the hall, besides being worked into the iron gate at the entrance to the terrace. Towards the end of the 16th century the buildings were reconstructed on their present plan of two quadrangles and a garden, with surrounding chambers and a central hall. The beautiful half-timbered frontage on Holborn is, owing to its position, the most familiar bit of "old London," and, thanks to the large-minded generosity of the Prudential Assurance Company, its owners, a priceless possession. The view from the terrace, hardly so well known, presents a singularly restful and attractive picture. According to T. Cato Worsfold, whose *Staple Inn and its Story* (London: Bumpus, 1907) is the standard work on the subject, the hall turret "has been held

time popular as a legal seminary, the number of students occasionally exceeding 200. In the reign of Henry VIII, if not before, it was attached as an appurtenance to Gray's Inn. But if the freehold then passed to Gray's Inn, it must have reverted at a subsequent period to the Society of Staple Inn to enable them to dispose of the freehold in 1884. The control of the Inn was vested in a Principal, elected every third year, a Pensioner (or Treasurer), eleven Ancients (whose ranks might be recruited from the juniors), and a Reader, chosen by the members out of three names submitted by Gray's Inn. The fatal fire of 1756 spared the hall, but destroyed some adjoining buildings, in addition to several of the archives and documents, including, unfortunately, the manuscript of the constitution and orders. In course of time the concentration of study at the Inns of Court and the *kudos* of membership of one or other of them proved inimical to the minor inns of Chancery, Staple Inn amongst them. The

Royal Commission of Inquiry appointed in 1854 reported in the following year that some of them had passed into private hands and others were heavily in debt, while the evidence showed that for more than half a century Staple Inn had done nothing for the benefit and advancement of the legal profession. Though its days were numbered as a legal institution, things went on as before for a period of nearly thirty years, when the buildings were sold in 1884 for £80,000. Part of the estate south of the terrace was afterwards acquired by the Government for an extension of the Patent Office, and it was in contemplation to demolish the rest to erect up-to-date flats and shops on the site, when the Prudential Assurance Company averted the threatened vandalism by acquiring the existing buildings for £68,000. There are interesting literary associations connected with the Inn. Dr. Johnson resided at No. 2 for a few months in 1759, whilst he was busy with *Rasselas*. Isaac Reed, the editor of *Shakespeare's Works* and the *European Magazine*, was admitted to the membership of the Society in 1769, occupied No. 1 for a time and afterwards removed to No. 11 (absorbed later in the Patent Office), where he died in 1807. Charles Baxter, the intimate friend of Robert Louis Stevenson, who dedicated *The Master of Ballantrae* to him, lived at No. 6 for several years, and the hall is now tenanted by the Institute of Actuaries. One set of chambers (No. 10) is familiar to readers of *Edwin Drood* as those occupied by Mr. Grewgious. It presented, wrote Charles Dickens, "in black and white over its ugly portal the mysterious inscription":

P
J T
1747

Mr. Grewgious bethought him at odd times that it might haply mean "Perhaps John Thomas" or "Perhaps Joe Tyler." As a matter of fact, Cato Worsfold shows that Grewgious (or his creator) unnecessarily laboured the point, for the initials refer to Principal John Thomson, who presided for two terms in 1747 and whose armorial bearings are to be seen in one of the windows of the hall.

Starch is a carbohydrate, having the composition $(C_6H_{10}O_5)_n$, which occurs in granules in most green plants. It is generally formed by plastids; in leaves and other parts exposed to light, within chloroplastids; in rhizomes, tubers, roots, or other parts not exposed to light, in contact with leucoplastids. A watery central mass, the hilum, is first formed, and then layers are added by apposition, the grains within plastids being commonly concentric, whilst those merely in contact with a plastid at one end grow most at that end and become excentric. The form and size of the grain are characteristic of different species, so that the adulteration of food-starches can be readily detected by the microscope. The smallest known grains are those of rice, less than one five-thousandth of an inch across; the largest, those of touts-les-

mois, one three-hundredth. The grains are doubly refracting and appear stratified. They contain from 2 to $5\frac{1}{2}$ per cent. of a less soluble substance known as farinose or starch-cellulose, forming a skeleton to the granule, the remainder being formed of the more soluble granulose. Starch, or rather granulose, turns blue with iodine and is very inert. When heated with water the grains absorb the water, swell, and ultimately burst, forming starch-paste; but not until heated to a very high temperature does it become truly soluble. When treated with malt extract (diastase), saliva or the pancreatic secretion, starch passes into dextrin, which is isomeric with starch, and maltose $(C_{12}H_{22}O_{11})$. The ultimate product of its hydrolysis by dilute sulphuric acid is dextrose or grape-sugar $(C_6H_{12}O_6)$, thus:—

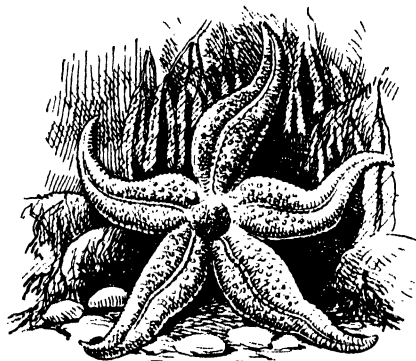


In the process of assimilation in green plants starch is the first visible product; but it originates from sugar in solution, and is itself always of the nature of a reserve substance. After the sugar has passed from the leaves to stems, roots, or seeds, starch is re-formed in them by leucoplastids. In germinating seeds or at the rise of the sap, diastatic action once more turns the starch into sugar. Starch is the most important heat-giving of force-producing ingredient in human food. Potatoes contain 15, wheaten bread 48, haricots 49, peas 51, oatmeal 63, maize 64, rice 76, and sago, tapioca, arrowroot and cornflour about 83 per cent. of starch. Besides its use under these various forms as food, enormous quantities of starch, which in the United Kingdom are made chiefly from rice and maize, are employed for laundry purposes and for stiffening textiles.

Star Chamber, an extraordinary court sitting at Westminster to try cases in which the Crown was especially interested, established as a regular criminal court by a statute of Henry VII. in 1486, consisting of a committee of the Privy Council. The court sat in the Star Chamber of the old House of Lords, and took cognizance of offences against the public welfare not specially within the jurisdiction of other courts. But its jurisdiction was gradually extended, and it became an arbitrary, secret, and cruel instrument of despotism. In 1586 it gagged the press at the instigation of John Whitgift (1530-1604), Archbishop of Canterbury. After being indefatigably employed in the repression of liberty under Charles I., it was abolished in 1641. Twenty years afterwards a committee of the House of Lords reported that "it was fit for the good of the nation that there be a court of like nature to the Star Chamber"; but the Government were not so foolhardy as to attempt to give effect to this retrograde pronouncement by submitting to the House of Commons a Bill for the revival of the iniquitous court.

Starfish belong to the phylum Echinodermata and the class Asteroidea. A short account of the anatomy of the commonest British Starfish

is given in the article on *Asterias*, and of the classification in that on *Asteroidea*. There are forty-two species living in British seas; they mostly inhabit shallow water, but many are



STARFISH.

found in very deep water: thus *Nymphaster* ranges down to 9,000 feet. The best-known British species are the Sun Star (*Solaster papposa*), which has many rays from a central disc; the thin leathery *Palmipes*; the tiny pentagonal *Asterina gibbosa*; the long-armed *Luidia*, famed for the suicidal habit of voluntarily breaking up its body; *Asterias rubens*, the common British Sand Star, and its larger and more northern ally, *Asterias glacialis*.

Starling, a bird belonging to the Passerine family *Sturnidae*, and to its type-genus *Sturnus*, with about ten species, all from the Old World. Unlike most birds of the order, they walk and do not hop, as one may see sparrows do. The Common Starling (*Sturnus vulgaris*) is a well-known British bird, about eight inches in total length; the plumage of the adult male is black, with green, purple, and violet metallic reflections, and the feathers, except those of the head and neck, bear a triangular buff spot at the tips. These spots are more conspicuous in the winter dress. Starlings are insect-eating birds, and associate in large flocks in the winter. The damage which they do to cherries and other fruits is fully made up for by the quantity of noxious larvæ they consume. The nest is a rude structure of straw and grass lined with feathers and wool, and contains from four to seven bluish-white eggs.

Star of Bethlehem, a plant of the genus *Ornithogalum*, so named from the star-like flowers, which are pure white within. It is indigenous to the Continent from France and the Netherlands to the Caucasus. It is common in gardens and readily runs wild. The bulbs are cooked and eaten in Palestine, and are believed by some authorities to have been the "dove's dung" of 2 Kings, vi. 25 (others think the pods of the Carob tree were referred

to, the error being due to an ancient scribe). *Ornithogalum caudatum*, a Cape species, sometimes known as the Onion Lily, is very tenacious of life, saving in cold weather, and blooms for a considerable period.

Star of India, THE MOST EXALTED ORDER OF THE, was instituted by Queen Victoria on February 23rd, 1861, and has been enlarged several times. The Order consists of the Sovereign, the Grand Master, and Ordinary Companions, with power to the Sovereign to appoint Extra and Honorary Members. The Ordinary Companions comprise the following three classes:—the first, 36 Knights Grand Commanders (G.C.S.I.); the second, 85 Knights Commanders (K.C.S.I.); and the third, 170 Companions and Honorary Members (C.S.I.). The Viceroy for the time being is the Grand Master and ex-Viceroy is additional to the 1st Class. The 1st Class is conferable upon Princes and Chiefs of India and such British subjects as shall have rendered especial service to the Indian Empire; while the 2nd and 3rd Classes are conferable upon those who by conduct and service in India or by service in the department of the Secretary of State for India have merited royal favour. The star is set in diamonds in the centre of gold rays and rests upon a light blue enamelled circular ribbon, with the motto of the Order—"Heaven's Light Our Guide" in diamonds. The collar is composed of the Indian lotus, palm branches and the united red and white roses, all linked, with an Imperial crown in the centre, the whole being richly enamelled on gold and in their proper colours. The badge is an onyx cameo of Queen Victoria, set in a perforated ornamental oval, containing the motto of the Order and surmounted by a star in diamonds. The ribbon is sky-blue, with a narrow white stripe towards each edge.

Stars. Most of the celestial bodies keep the same apparent distance from each other and are known as the fixed stars; they differ from the planets by a peculiar twinkling of their light. [SCINTILLATION.] On a very clear starry night about 2,000 stars may sometimes be seen by the eye alone in the northern hemisphere, but countless numbers are brought into view by a powerful telescope. In early times the stars were divided into constellations, these being named after some animal or mythological person to which they bore some fancied resemblance. The positions of the stars in the constellation were then noted. Some stars were considered brilliant enough to merit a special name, such as Sirius, Algol, etc. Early in the 17th century Johann Bayer (born at Rain in Bavaria in 1572; died at Augsburg in 1660) produced a celestial atlas in which he named the different stars in each constellation after the letters of the Greek alphabet. Thus we have α Tauri (Aldebaran), α Canis Majoris (Sirius or the Dog Star), β Orionis (Rigel), etc. The Greek letters are supposed to represent the order of brightness of the different stars in their constellation, α denoting the brightest. When the Greek letters are used up, ordinary letters

are called in, and finally numbers are invoked. The description of the position of stars is, however, often given in a confusing manner from different catalogues, so that photographs of the sky are much more easily understood. Stars are divided into magnitudes according to their brightness with respect to all other stars regardless of any particular constellation, and those down to the 16th and 17th magnitude can be viewed with the best of telescopes, the 6th being only just visible to the naked eye. The difference in brilliancy is due to the fact that the stars themselves are not equally bright, and also that their distances from us vary enormously. Some stars, however, have different magnitudes at different periods. These are known as variable stars, and the change in brightness occurs over regularly recurring periods. Double stars generally exhibit different colours—for instance, the two stars known as α Herculis are respectively red and blue. But single stars differ greatly in colour; Aldebaran is red, while many stars exhibit a white or bluish-white colour. The fixed stars experience changes in their number. Some disappear, while new stars sometimes start into existence. In 1572 it is recorded that a new star brighter than Venus appeared in Cassiopeia, but its colour and brightness gradually underwent change until at last it vanished. It may be that these new stars are simply recurrences of variable stars of very long periods. By means of careful observations on the annual parallax of the stars the distances of some of them have been measured. The star α Centauri in the southern hemisphere gives the greatest value of this parallax ($7\frac{1}{2}$ seconds), and is therefore the nearest to us. In spite of this, however, it is so far away that light takes $4\frac{1}{2}$ years to travel the distance. Light from the Pole Star takes over 42 years. Most of the stars are, however, so far away that their parallax is too small to be observed. Besides nebulae, clusters of stars very near to each other can be observed in different spots, and the individuals in these groups seem to exercise some influence upon each other, but their real connection is not understood. It has been observed that some of the stars have a motion in the sky which is known as the proper motion of the stars; in some cases it amounts to an apparent motion of 7 seconds a year, which means an immense real velocity of the star itself. The spectroscope [SPECTRUM] has revealed the constitution of many of the stars, and has shown that they are bodies very like the sun. It has hence been inferred that they are suns, and the sizes and brilliancy of some of them have been calculated; many are thousands of times greater and more luminous than our sun.

Stars and Stripes, the popular designation of the flag of the United States. It consists of thirteen stripes alternately red and white, equal to the number of the original States, with a blue union (the upper lefthand corner next the staff) marked with white stars corresponding in number with the total number of States, a star being added whenever a Territory is advanced to the status of a State. Thus in 1907, the number of States being 47, the blue union then bore 47 white stars. The

familiar description of the flag as "the star-spangled banner" will therefore be readily appreciated.

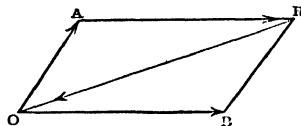
Staten Island, the most southerly portion of New York State, United States. It is also the southernmost part of New York City, of which it constitutes the borough of Richmond. It is roughly triangular in shape, is 14 miles long by about 8 miles broad, and covers an area of about 59 square miles. It is separated from Long Island Sound by the Narrows and from New Jersey by Staten Island Sound and Kill van Kull, the latter strait connecting Newark Bay with Upper New York Bay, and is five miles south-west of Castle Garden at the extremity of Manhattan Island. Its surface is undulating, rising to more than 300 feet in the north, and there is much picturesque scenery. Agriculture flourishes, iron ore is worked, but the fisheries form the most flourishing industry. New Brighton is the largest town, and the island forts Wadsworth and Tompkins on the Narrows are among the defences of the entrance to New York.

States-General, the national legislative bodies of the Netherlands, and of France before 1789. In a wider sense the term describes the legislature of a country in contradistinction to the assemblies representing the states or provinces composing the country.

States of the Church. [CHURCH, STATES OF THE.]

States' Rights, DOCTRINE OF, one of the distinctive tenets of the Democratic party in the United States, *i.e.* that the individual States enjoy all rights, powers, and privileges not specifically made over by the terms of the Constitution to the central government. Some extreme theorists have maintained even that each State had a right of secession from the Federation. It was upon such a construction of their rights that the Southern States seceded in 1860, and the Civil War followed in defence of the solidarity of the Union. Since the War (1865), however, the extreme view can only be held as a pious opinion or for academic argument.

Statics is that branch of Dynamics (or Mechanics) which deals with the balancing of forces acting on any body. Although such a balancing of forces causes the body to appear at rest, we must



remember that we are never in a position to regard anything as absolutely at rest. We can only deal with relative rest. A body which appears perfectly still with regard to the earth, is at the same time whirling through space with the velocity of our planet, so its condition of rest is only relative. The problem of statics is the discovery of the conditions which determine that any number of forces acting on a body shall produce equilibrium. If two forces

O A, O B act at a point O, their resultant is O R. [PARALLELOGRAM OF FORCES.] Hence a force R O is exactly sufficient to balance the two forces O A and O B. But A R is equal to O B, so that the system of forces O A, A R, R O, forming the closed figure O A R, is in equilibrium. This proposition can be extended, and it is quite simple to prove that if any number of forces acting at a point can be represented in magnitude and direction by the sides of a closed polygon taken in order, those forces will be in equilibrium. This is known as the Polygon of Forces. If two forces act on a body, this condition can only be fulfilled when the forces acting at a point are equal in magnitude and opposite in direction. If the forces act in a plane at different points of a body, the simplest method of arriving at the condition of equilibrium is to resolve the forces in two directions at right angles to each other. [RESOLUTION OF FORCES.]



[Photo]

STATIONERS' HALL.

Stationers' Company, THE, comprises the master, keeper, wardens and commonalty of the mystery or art of the Stationers of London. They are first mentioned in 1403, when their bye-laws were confirmed by the civic authorities, but were not incorporated till 1557. Queen Mary, in sanctioning this privilege, was partially influenced by a fanatic desire to put down heretical writings, and consequently empowered the Company to search any house, shop, or building of any printer, binder or seller for books published contrary to statute and regulation. James I. enlarged their privileges by conferring upon them the exclusive right to print almanacs, primers, psalters, A B C's, the *Little Catechism* and Nowell's *Catechism*. For at least two centuries the Company thus enjoyed the monopoly of publishing. Every printer had to serve his time to a Stationer, and every publication, as has been said, "from a Bible to a ballad," had to be "entered at Stationers' Hall." Though this astounding monopoly no longer exists, registration is still essential, under the Copyright Act (the fee being five shillings), before an action concerning infringement of copyright, or other such claim, can lie. In all other respects, however, registration is neither compulsory nor necessary to secure copyright. The press censorship which the Company had acquired under former Licensing Acts was often exercised so arbitrarily and so grossly that the Acts were abolished in 1694. Of course the monopoly involved certain disabilities, and Archbishop Laud exacted a heavy fine from the Company for the issue (in 1632) of the edition of the Bible in which the Seventh Commandment was made to read, "Thou shalt commit adultery," while the printer was fined £3,000 for another edition of the Bible in which a verse of the 14th Psalm ran, "The fool hath said in his heart, There is a God." The first Stationers' Hall was in Milk Street, Cheapside. The Company then removed to St. Peter's College, and afterwards (in 1611) to Burgavenny House, the mansion of Lord Abergavenny, which stood on the site of their present Hall and was destroyed in the Great Fire of 1666, when the Company suffered a loss of property amounting to £200,000. The existing Hall was built shortly after this calamity in what is now called Stationers' Hall Court, Ludgate Hill. Among interesting events in the history of the Company are the musical festivals which they used to hold in their Hall on St. Cecilia's Day, November 22nd, for one of which John Dryden wrote (1697) his ode of "Alexander's Feast," as he had composed another ode for an earlier festival, and the purchase, in 1858, of Dr. Johnson's house and garden in Bolt Court, Fleet Street. The house has been preserved, but on the site of the garden

[Pictorial Agency.]

Then the sum (algebraical) of the forces in each of these two directions must be zero; but this is not all. Since the forces are not acting at a point, they may produce a rotation, and for this not to happen the sum of the moments of the forces [MOMENT] about any point in their plane must also be zero. If forces act on a rigid body in any direction whatever, the conditions for equilibrium are that the algebraical sums of the components of the forces about each of three axes at right angles must be zero, and the sums of the moments of the forces about the same three axes must also be zero. An important set of problems in statics is concerned with finding the centres of gravity or mass centres of different bodies, the forces under consideration being in that case the weights of the different particles composing the body. Equilibrium which is concerned with the balance among the forces acting on a body, may be stable, unstable, or neutral [STABILITY], and the state of greatest stability is reached when the body possesses the minimum potential energy. [ENERGY.]

was erected (1861) the Stationers' School for the sons of liverymen and freemen of the Company.

Stations of the Cross (*Via Crucis*; *Via Calvarii*). In Catholic devotion, a series of images or pictures representing the different stages in the Passion of Jesus, each station corresponding to a specific event. As a rule, the stations are disposed round the church, the first being placed on one side of the high altar and the last on the other. Occasionally they are erected in the open air, more particularly on the roads leading to a shrine or church on a hill. In some of these instances the statuary of the Calvary are remarkably beautiful examples of the sculptor's art. The devotion originated with the Franciscans, the custodians of the Holy Places in Jerusalem. Since it was impossible, excepting to the wealthy leisured classes (and not even to them at one period, save at the risk of their lives), to visit Palestine and see the spots hallowed by the sufferings of Jesus, the devotional usage of the stations was invented to enable the faithful to make, in spirit, the pilgrimage to the scenes in question. There are 14 Stations, namely—(1) the sentence passed on Jesus by Pilate; (2) the receiving of the Cross; (3) Jesus's first fall; (4) His meeting with His mother; (5) the bearing of the Cross by Simon of Cyrene; (6) the wiping of Jesus's face by Veronica with a handkerchief; (7) His second fall; (8) His words to the women of Jerusalem, "Weep not for me," etc.; (9) His third fall; (10) His being stripped; (11) His crucifixion; (12) His death; (13) the descent from the Cross; (14) His burial. There is no authority for the fifteenth Station occasionally introduced—The finding of the Cross by Helena—nor for the reduction of the number of the Stations to 11, an innovation which was carried out in the diocese of Vienna towards the end of the 18th century.

Statius, PUBLIUS PAPINIUS, Latin poet, was born at Naples, probably about A.D. 45, and was taught by his father, a literary man of repute. He settled in Rome, and only returned to Naples at the close of his career. He died in or about 96. His works consist of two epics, entitled respectively *Thebais*, in 12 books, and the unfinished *Achilleis*, in 2 books, and a collection of short pieces named *Silvæ*. These poems, and especially the latter, have been often reprinted, but they do not give Statius a very high place among the Roman writers. His adulation of Domitian has not tended to enhance his fame.

Statute of Uses was passed in the reign of Henry VIII. (27 Henry VIII., c. 10). It, in effect, enacted that the use should be the land, and that where the use was there the land or legal estate should be, and should be deemed to be. In consequence of this statute the word "use" departed from its original signification, and became equivalent to seisin or legal estate.

Statutes at Large, an authentic collection of the various statutes which have been passed by the British Parliament from very early times up to the present day. The oldest of these now extant and printed in the Statute Book is the famous

Magna Charta as confirmed in Parliament, 9 Henry III., though doubtless there were many Acts before that time, the records of which are now lost, and the provisions of which are in the present day currently received for the maxims of the old Common Law or customs of the realm and form the spirit of the *lex non scripta*. The statutes from Magna Charta down to the reign of Edward II. (including also some which, because it is doubtful to which of the three reigns of Henry III., Edward I., or Edward II. to assign them, are termed *incerti temporis*) compose what have been called the *vetera statuta*; on the other hand, those from the beginning of the reign of Edward III. are contradistinguished by the appellation of the *nova statuta* (See *A General Treatise on Statutes*, p. 626, by Sir Fortunatus William Lilley Dwaris [1786–1860]). The collection known as the Statutes of the Realm was printed by command of George III. in pursuance of an address of the House of Commons. It was drawn up under the Record Commission from original records and authentic manuscripts, and covered the period from 20 Henry III. (1235) to the end of the reign of Queen Anne, 13 Anne (1713).

Staubbach (German, "dust stream"), a waterfall in the canton of Berne, Switzerland, in the Oberland, a short distance south of Lauterbrunnen. It is one of the loftiest in Europe, and owing to its enormous height (1,000 feet), the comparatively small volume of the water, and the effect of the wind, it is dissipated into spray (hence its name) before it reaches the bottom. As it passes over the face of the rock, this friction and the retardation of the atmosphere give it the aspect, when viewed in front, of a beautiful lace veil.

Staunton, HOWARD, chess-player and editor of *Shakespeare's Works*, born in 1810, was reputed to be the natural son of Frederick Howard, fifth Earl of Carlisle. A neglected youth, with a precarious education, completed it is said at Oxford, on attaining his majority he received a sum of money under his father's will, which he quickly spent. Dependent upon his own exertions he sought a livelihood in writing upon the Elizabethan drama and chess. He had a great love both for the stage, on which he claimed to have acted with Edmund Kean, and for chess, of which, by 1840, he was recognised as a skilful player. After engaging successfully in a series of matches with Cochrane, in 1843, he went to Paris, where he defeated St. Amant, the champion of Europe, by which he gained a world-wide reputation. In 1846 he defeated Horowitz and Harwitz, the German players. By 1851 his powers began to decline, and after the defeats he sustained in the following year he rarely played in public. He turned his experiences to journalistic account, and from 1844 until his death he had charge of the chess column in *The Illustrated London News*. His *Chess-player's Handbook* (1847), and *Companion* (1849), for long had the reputation of being the best English works on the game, and his name was given to a set of chess-men which are considered the standard type among English players. From 1854, in which year he married

Frances, widow of W. D. Nethersole, he became a careful student of Shakespeare, of whose works he was an enthusiastic admirer. His first edition of them appeared between 1857 and 1860, with illustrations by Sir John Gilbert. Based upon a collation of the early folios and quartos with the texts of modern editors, it exhibits considerable research, and was republished, without the illustrations, in 1864, in which year he issued his fine reproduction of the 1600 quarto of *Much Ado About Nothing*, followed, in 1866, by his photo-lithographic facsimile of the first folio edition of 1623. He subsequently wrote a series of valuable articles, *Unsuspected Corruptions of Shakespeare's Text*, which appeared in *The Athenæum*, and a careful history of *The Great Schools of England*. Staunton died suddenly, of heart disease, in London, on June 22nd, 1874.

Staurolite, a silicate of aluminium with peroxide of iron, crystallising in cruciform macles belonging to the Rhombic system, the name being derived from the Greek *stauros*, a cross. It is generally an opaque brownish colour, with conchoidal fracture, is infusible, and has a specific gravity of about 3.5 and a hardness of 7 or 7.5. It occurs in slates and mica-schists as a result of metamorphic action.

Stavanger, a seaport of Norway, on the Bukken Fjord, an inlet of the North Sea, 100 miles S. of Bergen. St. Swithun's cathedral, founded at the close of the 11th century, burnt down and rebuilt in 1272, is one of the finest examples of Northern Gothic in the kingdom. Stavanger is a picturesque old town, built largely of wood. Apart from the fisheries, which are of first-class importance, there are manufactures of woollens, linen and cotton, preserved foods, butter, margarine and flour, lime, hardware, pottery, bricks and tiles, soap, furniture, shoes, and artificial manures, besides shipbuilding and iron-founding. Pop. (1900), 30,541.

Stavropol, a government of the province of Northern Caucasus (Ciscausia), Russia, bounded on the N. by Astrakhan and the province of the Don Cossacks; on the E. by the Caspian; on the S. by Terek, and on the W. by Kuban. It occupies an area of 20,654 square miles. The surface largely comprises plateaus and steppes, but in the west there are mountains reaching a height of 4,600 feet above the sea. The government is principally watered by the Kuma and its tributaries, but irrigation is scanty. Timber is scarce, but salt lakes occur near the Caspian. In spite of the severe and trying climate agriculture flourishes, and great crops are yielded of wheat, oats, barley, rye and potatoes, besides flax, melons and sunflowers. Sheep, cattle, horses, pigs and camels are raised on a large scale. The industries include distilling, tanning, and the making of candles, flour, and oil, while the exports of grain, wool, hides and flax are heavy. The capital, Stavropol (44,680), is 360 miles N.W. of Tiflis. Pop. (estimated), 970,000.

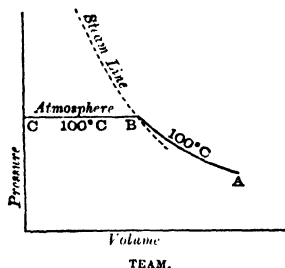
Steam is water in the state of vapour. Although it is popularly supposed that steam is only

produced when water is boiling, it can, in point of fact, exist at any temperature. The humidity of the atmosphere is simply due to the presence in it of water vapour or steam. Further, the amount of water vapour present in any space depends only on the temperature, and is independent of the presence of other gases. If we have a vessel, closed by a movable piston and containing nothing else but a little water, that water will begin to evaporate and continue this action until the space above it is saturated with vapour. At this point the number of molecules which force their way out of the liquid through its surface layer is exactly counterbalanced by the number which return from the space above. There is therefore equilibrium, and as long as the temperature remains constant the pressure of the vapour is unaltered. If we attempt to increase the pressure of the vapour by pushing in the piston (still keeping the temperature the same), we shall find our efforts unavailing. Some of the steam condenses; it is less in quantity, but its pressure persists, and this pressure is known as the vapour pressure. Steam at the vapour pressure, therefore, is just on the point of liquefying, and is said to be saturated vapour. The following table gives the vapour pressure of steam at different temperatures:—

Temp.	Vapour Pressure in Millimetres of Mercury.	Temp.	Vapour Pressure.	Temp.	Vapour Pressure.
—32°C.	320	20°C.	17.80	100°C.	760
—20	929	40	54.90	110	1,075.37
—5	3 113	60	148.79	130	2,030.28
0	4 6	80	354.64	150	3,581.23
10	9 165	90	525.45	200	11,688.96

Below the freezing-point, it is evaporation of the ice itself which produces water vapour; solid and gas exist together without the presence of the liquid form. We can give heat to the water in our closed vessel till all is converted to saturated vapour. On applying further heat we cause the temperature of the vapour to rise; it is no longer saturated, but is said to be superheated, and then we can increase the pressure without causing condensation. The steam, in fact, behaves like any other gas; pressure and volume vary inversely, diverging but slightly from conformity with Boyle's law. At any one temperature we can plot out a curve showing the connection between the volume and pressure of the steam, and such a curve is known as an isothermal. At 100° C. there will be a curved portion A B, differing very slightly from a hyperbola (see diagram); then when the pressure is one atmosphere, the vapour will be saturated. We cannot increase the pressure farther, but steady diminution of volume occurs as more liquid is formed, and this is indicated by the straight line B C. Every temperature gives a similar curve, but the length of B C gets less and less as we take higher temperatures, until at one point it vanishes. This point is known as the critical point. Here the temperature, pressure, and volume have fixed values—not easy to determine experimentally, however. The critical temperature of water is 365° C., and

above this temperature it is impossible to liquefy steam by pressure. If we drew a number of isothermals and connected all at the point B, we should get a curve showing the volumes and vapour pressures of saturated steam at different temperatures. This curve is known as the steam line. It bends up towards the critical point, where it meets a corresponding curve showing the volume of the condensed water formed at different temperatures, and called the water line. It is not possible to show on a small scale the volume of water formed,



since the volume of saturated steam at the same temperature is so enormously great compared with it. For instance, 1 lb. of water will occupy '016 of a cubic foot at 212°, while the steam formed from it will be 26'36 cubic feet. If B C represent the latter quantity, '016 vanishes from view on the same diagram.

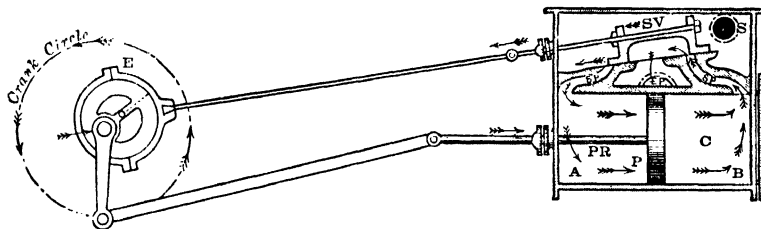
Since heat must be given to water to convert some of it into steam, and both remain at the same temperature, it is obvious that this heat has been used up in some other way which a thermometer is unable to indicate. This is known as the latent heat of steam, and at 100° C. it requires as much heat to convert a pound of water into a pound of steam as to raise 5'36 lbs. from 0° to 1° C. This is expressed by saying that the latent heat of steam is 5'36. When once the steam is formed, however, the heat required to raise its temperature one degree is less than water would require for a similar purpose, the specific heat of steam being only '4805. If steam is being generated in a closed vessel, the temperatures of water and steam can both rise above 100° C., the pressure of course increasing. At 112° C. we know the pressure is 1 atmosphere; at 120° it is 2 atmospheres; at 134° it is 3, and at 143° it is 4. Hence we note the enormous force exerted on the vessel as heat is applied to it, the force doubling itself twice during a temperature rise of only 43° C. Great care is therefore necessary in dealing with steam under these conditions; otherwise it is liable to burst the vessel in which it is confined, the possibility of such a result being demonstrated with moderate frequency by boiler explosions.

Steam-Engine is a machine for doing work by means of the elastic force of steam. In the earliest practicable form of engine—devised by Thomas Newcomen (1663-1729) about 1712, and used to some extent for pumping water from

mines—steam was admitted from a sort of overgrown kettle into a cylinder provided with a piston which was arranged to be lifted by the weight of the pump-rod. Cold water was then injected into the cylinder, and the consequent condensation of the steam produced a partial vacuum under the piston which was thus forced downwards by atmospheric pressure. The piston-rod and pump-rod were connected to opposite ends of a beam pivoted at its centre, so that the descent of the piston of the engine raised the piston of the pump. In 1759 James Watt (1736-1819) began to improve this very inefficient arrangement. He provided a separate vessel in which the steam was condensed, thus saving the steam needed to heat the walls of the cylinder at each stroke, and applied the pressure of the steam to lift the piston. He further increased the power of his engine by admitting steam alternately to both sides of the piston, and provided an air-pump to remove any uncondensed gases from the condenser. He also introduced the crank for converting the reciprocating motion of the piston-rod into a rotary motion, and the centrifugal governor for regulating the supply of steam so as to give an approximately constant speed. The general arrangement of the essential parts of a modern steam-engine are shown in the diagram. Steam is admitted into the valve-chest, which is a closed box secured to one side of the cylinder, with both ends of which it communicates by means of two pipes or steam-ports S P. An exhaust-pipe E P is also provided, and these three openings in the side of the valve-chest—which is here made perfectly flat and smooth—are uncovered or connected together by a sliding valve V, which is an iron box open at one side, this open side fitting on the face of the valve-chest. The cylinder C is an iron tube carefully bored out and closed at each end by cylinder-covers; it is provided with a piston P, to which is secured a piston-rod P R, capable of sliding through a central hole in one cover. Leakage of steam past the piston is prevented by metallic rings fitting in a groove in the piston and forced outwards by springs, so as to be always in contact with the wall of the cylinder. The piston-rod works through a stuffing-box, which is a short tube packed with hemp or asbestos, and provided with a screw cover to compress this packing against the rod and prevent escape of steam. The arrangement of the connecting-rod and crank will be evident from the diagram. The motion of the slide-valve is produced by an eccentric-pulley E secured to the crank-shaft. A ring fitting this pulley is attached to the eccentric-rod, which is jointed to the valve-rod. The latter passes through a stuffing-box in the valve-chest, and is fixed to the valve. When the various parts are in the position shown, steam which is supplied to the valve-chest can pass into the end A of the cylinder, while the other end is in communication with the exhaust-pipe E P. The pressure in the A end will therefore be approximately the same as that in the boiler—say 80 lbs per square inch—while that in the B end will either be the atmospheric pressure, or, if a condenser is used, will be, say, 12 lbs. per square inch less than that. These pressures will cause the piston to move

from A to B, and the crank-shaft will be turned in the direction shown by the arrows. The eccentric turns with the crank, and it is evident from their relative positions that the slide-valve will now be moving in a direction opposite to that of the piston, and that the result of this will be that as the piston nears the end of its stroke both ports S P will be closed, thus shutting off the supply of steam. When the crank has moved 90° from the position shown, any pressure on the piston can of course produce no rotation; but the fly-wheel, which is always secured to the shaft, has sufficient momentum to continue the motion, and when the crank has turned a few degrees farther, the slide-valve will have moved sufficiently far to open the port connecting the B end of the cylinder with the steam-chest and to connect the A end with the exhaust. The piston will then be forced towards the A end of the cylinder, and at the end of the stroke the steam will be again shut off, and the whole cycle of operations will be repeated. In order to obtain economy, it is necessary that the steam should be exhausted (either into the air or into the condenser) at as nearly as possible the atmospheric pressure. The steam is therefore not admitted into the cylinder during the whole of the stroke, but is cut off when the piston has performed a portion of its movement, and this fraction of a cylinder-full of steam expands and gives up its energy during the rest of the stroke. The exhaust-port also must be closed rather before the end of the stroke, so that the compression of the steam behind the piston may cause it to be stopped gradually. If a heavy and rapidly-moving piston

or the condenser, but into a second cylinder of larger diameter, where it is further expanded, and is in some cases exhausted into a third or even a fourth cylinder before passing into the condenser. In order to ascertain the power developed by a steam-engine it is necessary to know the mean pressure in the cylinder, which is of course quite different from that in the boiler. An indicator is used for this purpose, which consists of a cylinder provided with a piston, usually of half a square inch area. This is connected with the engine cylinder by means of a short pipe, and the pressure pushes up the indicator piston against a spiral spring. If the force needed to stretch or compress the spring is known, the motion of the piston will be a measure of the pressure. The piston moves a pencil by means of a system of multiplying levers, and draws a line on a piece of paper wrapped round a small drum. A string wound on this drum is connected to the piston-rod of the engine, so that a reciprocating rotary motion is given to the cylinder of paper which is similar to the motion of the piston. In this way the pencil draws a curve the axes of which are respectively proportional to the pressure on the piston and to the distance it has moved. The area of this curve is thus proportional to the work done on the piston, and from it it is easy to find the average pressure on the piston. If we multiply this average pressure (in pounds per square inch) by the area of the piston in square inches, we shall get the total mean pressure on the piston; and this multiplied by the distance travelled by the piston (in feet) per revolution and by the number of revolutions per minute, will give us the



STEAM-ENGINE.

were stopped suddenly, an injurious jar would result. A simple slide-valve may be made to perform these somewhat complicated functions by being correctly proportioned; but a second valve, operated by a separate eccentric, is often added to enable the steam to be cut off more exactly at the proper moment. Other valve-motions have also been devised to enable the ports to be suddenly opened to their full extent, in order to avoid the loss of pressure which results from forcing the steam through a partly opened port. Very high steam pressures are now used for large engines; and as it is found impracticable, when working at 150 or 200 lbs. per square inch, sufficiently to expand the steam in one cylinder, compound engines have been designed. In these a fraction—say one-half of a cylinder-full of steam—is admitted into a cylinder, and, after expansion, is exhausted, not into the air

number of foot-pounds of work done per minute, and this, divided by 33,000, will be the indicated horse-power. This is, of course, somewhat greater than the actual available power, as some portion of it is used in overcoming the friction of the moving parts of the engine. The indicator diagram is also of great utility for showing whether the valves are or are not properly adjusted.

Steam-Hammer is a tool largely used in ironworks for “shingling” or removing slag from the puddled ball and for making iron or steel into blooms, billets, etc., and for many other purposes. A cylinder similar to that of a steam-engine is secured in an upright position to a very substantial iron or steel frame, and to the piston-rod, which projects from the lower cylinder-cover, is attached a heavy block of iron or tup,

working in guides. The tup carries the hammer-block, which can be removed for repairs when its face becomes worn, and immediately beneath this is the anvil-block. By means of suitable valves steam is admitted under the piston and raises it, together with the tup; steam being then admitted to the upper side of the piston, the hammer falls both by its own weight and by the pressure of the steam. By regulating the steam pressure and also by throttling the exhaust the force of the blow may be accurately adjusted. The weight of the piston-rod and tup may be anything up to 100 tons. The steam-hammer was invented by James Nasmyth (1808-90) in 1839, although attempts have been made to deprive him of the honour, and the first hammer he saw in actual operation was in 1842 at the great ironworks at Creusot in the department of Saône-et-Loire, France, the proprietor of which, Joseph Eugène Schneider (1805-75) had seen Nasmyth's sketches during a visit to the latter's foundry at Patricroft, near Manchester, in 1840. Nasmyth then took immediate steps (June 9th, 1842) to protect himself by patent, but he was forestalled in France by Schneider, who patented the hammer in his own name on April 19th. The ethics of the transaction speaks for itself. The first steam-hammer erected in England was set up at Patricroft in 1843.

Steam-Pump. [VACUUM-PUMP.]

Stearin. Most of the natural animal fats contain, together with palmitin and olein, a substance closely resembling the former, which is known as stearin. It consists of a compound of glycerine, with stearic acid, and by the action of an acid or superheated steam may be decomposed into these two constituents. The acid itself may be so obtained as small waxy-looking leaflets which melt at 62° C. It possesses the composition $C_{18}H_{36}O_2$, being a member of the group of compounds known as the fatty acids. The stearin candles do not consist of stearin itself, but of a mixture of this stearic acid with the closely allied palmitic acid.

Steatite (known also by the names of soap-stone and French chalk) consists of a silicate of magnesium, $Mg_3Si_4O_{10}$. It is a white or coloured mineral with a peculiar soapy feel, and occurs in Cornwall, Sweden, and in various parts of the United States and South-Eastern Asia. It is used for a variety of purposes—*e.g.*, as a lubricant and polishing powder, for drawing or marking on fabrics (as on cloth by tailors) or glass, for cleaning silk, leather, etc., while its addition in the manufacture of porcelain has been found to improve the appearance of the product. In the cunning hands of expert Burmese and Chinese modellers it lends itself well to the production of all kinds of ornaments.

Steel is a compound or mixture of iron and carbon containing from 0.1 to 1.25 per cent. of the latter, as well as small quantities of other bodies, such as silicon, sulphur, phosphorus, manganese, etc. It has not been satisfactorily determined whether the carbon is combined with or dissolved

in the iron, but it does not exist in steel as free graphite, as it does in cast- or pig-iron. Steel is superior to iron in tensile strength, elasticity, and rigidity, and is so in a greater degree as the proportion of carbon is increased. The presence of phosphorus in quantities exceeding 0.1 per cent. causes steel to be hard and brittle, or "cold-short"; more than about 0.05 per cent. of sulphur makes the metal "red-short" or brittle, and unworkable at a red heat. Silicon produces a like effect if 0.5 per cent. is present; other impurities produce similar undesirable properties; but sometimes other metals, as chromium and tungsten, are alloyed with steel for special purposes. The harder kinds of steel, containing 0.5 per cent. of carbon and upwards, undergo a molecular change when heated to redness and suddenly cooled, with the result that they are hardened. Mild steels containing a little carbon are hardly (if at all) affected by this process, while those containing 0.1 per cent. of carbon may readily be rendered sufficiently hard to scratch glass. As steel when very hard is also brittle, cutting tools, springs, etc., are "let down" or softened to the required extent by being again heated and cooled. The amount of this annealing depends upon the temperature of the second heating, which is ascertained by noting the colour assumed by the film of oxide which is formed on the polished metal. The mild grades of steel are used for rails, girders, shipbuilding, and other purposes for which wrought iron was previously employed. If the percentage of carbon is less than about 0.3 such steels can be welded. Steel can be made by smelting a pure iron ore with charcoal, but this process cannot be used in the case of the ordinary impure ores. The conversion of cast-into wrought-iron by puddling involves the removal of most of these impurities, and the highest class of steel is made by adding carbon to Swedish malleable iron by the cementation process. In this process bars of the pure iron are subjected to an intense heat for a prolonged period, in contact with charcoal, and carbon is gradually absorbed. As the carburisation is not uniform, this "blister" steel is frequently converted into cast-steel by melting in crucibles, so that a general distribution of carbon is obtained. In the Bessemer and basic processes the carbon and impurities present in cast-iron are burnt by a current of air forced through the molten metal, or are absorbed by the slag which floats on its surface, and in this way tolerably pure iron is obtained. The requisite quantity of carbon is then added in the form of spiegeleisen or ferro-manganese, which are compounds of carbon, iron, and manganese. In making open-hearth or Siemens-Martin steel, wrought-iron or scrap steel is dissolved in melted pig-iron in the regenerative furnaces, and in some cases iron ore is substituted for the scrap. Steel may also be produced by a process of puddling very similar to that employed for making malleable iron. There are several difficulties in obtaining sound castings of steel due to the liberation of occluded gases, which produce cavities, and to other causes. The most satisfactory method of obviating this is to compress the metal into the mould while still

molten by heavy hydraulic pressure; but this process is necessarily expensive, and so can only be used for the highest class of work. Steel has been used in the East from a very early period, but where or how it was first manufactured is unknown. It is not mentioned in our sense of the word in the Old Testament, the "steel" of the authorised version referring to brass.

Steele, SIR RICHARD, essayist, playwright and politician, was born in Dublin in March, 1672. His father, a prosperous lawyer, died before the boy was five years old, and little is known of his mother. In 1684 he was sent to the Charterhouse School, where he formed a lifelong friendship with Joseph Addison, and in 1689 he went, with an exhibition, to Christ Church, Oxford. In 1691 he was elected to a Postmastership at Merton College, but did not remain to take his degree. He enlisted as a private in the Guards, a step which cost him the succession to an estate in county Wexford, Ireland. His conduct at this time

was irregular, but his deepening sense of the seriousness of life, and his remorse at fighting a duel in Hyde Park (1700) in which he nearly killed his man, led him to publish in 1701 his *Christian Hero*, a treatise so solemn that he felt it "incumbent on him to enliven his character" by writing a comedy, *The Funeral; or, Griev'd à la Mode*. In 1703 followed *The Lying Lover; or,*



SIR RICHARD STEELE.

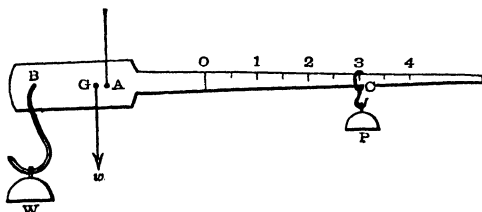
The Ladies' Friendship, which, he said, was "damned for its piety." Two years later he was more successful with *The Tender Husband; or, The Accomplished Fool*, after which he abandoned the stage until 1722, when he brought out *The Conscious Lovers*, which, it may be said here, was also his last comedy, and was a hit and fetched him 500 guineas from George I., to whom it was dedicated. In 1705 he married Mrs. Stretch, a wealthy widow, who died in December, 1706. He next began to receive favours at Court. He became Gentleman-in-Waiting (1706) to Prince George of Denmark, Gazetteer (1707), and Commissioner of Stamps (1710). Perhaps it was in consequence of his connection with the official organ of news that he formed the idea of a periodical containing essays on social and literary subjects, which he carried out in *The Tatler* (1709-11) under the name already made famous by Swift, of "Isaac Bickerstaff, Esq." The paper was published thrice a week, and in it he soon received the help of Addison, who also worked with him on the daily paper which succeeded it, *The Spectator* (1711-12). The other ventures of Steele in

journalism were *The Guardian* (1713), *The Englishman* (1713), *The Lover* (1714), *The Reader* (1714), *Town Talk* (1715), and *The Tea Table* (1716). Meanwhile, in 1707 he had married the comfort and plague of his life, Mary Scurlock, the beloved "Prue" of his love-letters. Although he had a large income, he was always in debt, and yet he maintained his independence, for he resigned his Commissionership when, in the penultimate year (1713) of Anne's reign, he entered Parliament as member for Stockbridge in Hampshire with the determination to oppose the Government on the questions of the fortifications of Dunkirk and the Protestant succession. In consequence of paragraphs he had written, he was deprived of his seat by a vote of the Commons (1714), a step which led to *Mr. Steele's Apology for Himself and His Writings*. The accession of George I. brought to him more than he had lost. He became member for Boroughbridge in Yorkshire and Deputy-Lieutenant for Middlesex, and was knighted (1715). He was also appointed Surveyor of the Royal Stables, Supervisor of Drury Lane Theatre, and one of the Commissioners for the estates forfeited in Scotland in consequence of the Jacobite insurrection of 1715. He lost his wife in 1718, was elected member for Wendover in Buckinghamshire in 1722, and in 1724 he withdrew in bad health into the country, with the intention of retrenchment in the hope to pay off his creditors. He died at Carmarthen on September 1, 1729. His essays live through the kindly humour and subtle insight into character which they everywhere display.

Steell, SIR JOHN, son of John Steell, carver and gilder, and elder brother of GOURLAY STEELL (1819-1894), the admired animal painter, was born in Aberdeen, on September 18th, 1804. Apprenticed to his father to learn wood-carving, he afterwards chose sculpture as his profession, and studied first at the Trustees' Academy in Edinburgh and then in Rome, where he remained for several years. Returning to Edinburgh in 1833, he modelled the group "Alexander Taming Bucephalus," which brought him into prominence. It was not cast in bronze until 1883, when it was erected in St. Andrew Square, Edinburgh. Sir Francis Chantrey urged Steell to remove to London, but he preferred to remain in Scotland, desiring to improve native art. A commission for the colossal statue of Queen Victoria, which surmounts the Royal Institution, gained him the honorary appointment of Sculptor to Her Majesty in Scotland. This was followed by his success in the competition for the statue of Sir Walter Scott which occupies George Meikle Kemp's beautiful Gothic monument in Princes Street, Edinburgh, said to have been the first marble statue commissioned in Scotland from a Scots artist. Commissions for the familiar equestrian statue of the Duke of Wellington in front of the General Register House in Edinburgh and many others followed. His largest, though by no means his best work, was the Scottish memorial to the Prince Consort in Charlotte Square, Edinburgh, at the inauguration of which in 1876 Steell was knighted, by the Queen. In 1879 he became a Royal Scottish

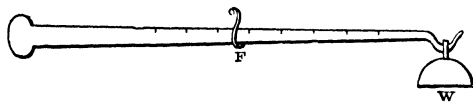
Academician and after living in retirement for many years, through ill health, he died in Edinburgh on September 15th, 1891.

Steelyard, a balance consisting of a lever in the form of a slender iron bar, one arm of which is very short, while the other is long and divided into equidistant notches, and operating on the principle explained by the diagram and accompanying text. Let the beam be supported at the point A, while its weight w acts at C. The weight P is moved



COMMON STEELYARD.

until at a point O it exactly balances the weight of the beam above. A 1 lb. weight is now attached to the beam, and its weight acts downwards at B. P is moved till balance is obtained, and its position marked 1 lb. Points 2, 3, 4, etc., are then marked on the beam at distances apart equal to O 1. That equal distances along the arm correspond to equal additions of weight to w is seen from the following considerations: If P at a point C just balances w , we have equilibrium, and consequently the moments of w and w about A just neutralise the moment of P about A. Hence $w \times AB + w \times AC = P \times AC = P \times (AO + OC)$. But the point O is such that $w \times AG = P \times OA$, hence $w \times AB = P \times OC$. But A B and P are fixed, so that O C varies directly with w . Hence the distance from O at which P



DANISH STEELYARD.

must be placed when the weight is 2 lbs. is just twice what it must be for 1 lb., and so on. The Danish steelyard consists of a beam with a heavy lump at one end and a hook for the weight at the other. The substance is weighed by altering the position of the fulcrum (F) till equilibrium obtains. The arm is graduated by hanging weights of 1, 2, 3, etc., lbs. at the end, and marking the position of F. The distances representing equal differences of weight are not equal in this form of the steelyard, so the subdivisions are not so easily estimated. The word means literally a steel rod and is wrongly explained as the balance or weight employed by the Merchants of the Steelyard, a corporation of Hanseatic merchants who were established in London in 1259 on the Thames side near Cosin Lane (not far from the modern Old Swan Pier). In course of time they became one of the most powerful trading bodies in London and at last

aroused the jealousy of the commercial community, on whose complaints they were at length deprived of their privileges in the reign of Edward VI., being ultimately expelled in 1597. Their guildhall in Thames Street was converted into a warehouse for naval stores. It contained Holbein's great mural pictures of "The Triumph of Riches" and "The Triumph of Poverty" which, coming into the possession of Charles I., are conjectured to have perished in the fire which destroyed Whitehall Palace, though some believe they were sold into Flanders.

Steen, JAN HAVICKSZ, painter, was born at Leyden, in Holland, in the year 1626. He studied at Utrecht under Nicholas Knaffer and at Haarlem under Adrian van Ostade and Jan van Goyen, whose daughter he married in 1649. The son of a brewer, in 1667 he became a brewer himself at Delft, where he opened an inn five years later. It is commonly said that he led the life of a drunken debauchee, but his amazing industry seems to render some qualification of so sweeping a generalisation necessary. But the facts of his career are meagre. He died at Leyden in 1679. His workmanship at its worthiest discloses all the highest qualities



AN INTERIOR WITH FIGURES.

(By Jan H. Steen.)

of Dutch *genre* painting. He was a correct and vigorous draughtsman, had a fine eye for composition, as a colourist was noted for his transparency and limpidity and was possessed of a rare sense of broad humour. He ranks with the best Dutch masters.

Steeplechase, a horse-race across country, where hedges or hurdles and ditches or streams or trenches containing water have to be crossed, the course being marked out by flags. Originally the competitors had to reach a specified goal (perhaps guided by a steeple) as best they could. This is the accepted origin of the name, although it is sufficiently absurd, since one cannot chase what does not run and a church spire is a stationary

feature. This type of horse-racing probably began in the middle of the 18th century, and there is record of a match in Ireland in 1752 over $4\frac{1}{2}$ miles of country. In England the principal event in the year's steeplechasing is the Grand National at Liverpool, which was started in 1839, over a course (4 miles, 856 yards) thrice as long as the Derby course at Epsom and containing thirty obstacles mostly formidable.

Steeple-jack, a mason or bricklayer who ascends steeples or tall chimneys to execute repairs or to fix or remove scaffolding. In London one of the most familiar exhibitions of this kind of adroitness is furnished when the Nelson column in Trafalgar Square is climbed every autumn in order to decorate the pillar with a huge laurel wreath for Trafalgar or Nelson Day (October 21st).

Steer, PHILIP WILSON, artist, was born at Birkenhead, Lancashire, England, on December 28th, 1860. He studied at the École des Beaux Arts in Paris under Cabanel, during which period he exhibited several works in the Salon. Returning to London he became one of the original members of the New English Art Club, at whose exhibitions his work has always held a prominent place. He is chiefly known as a landscape painter. His pictures, in this branch of art, are remarkable for their excellent rendering of light and atmosphere. He has also painted many distinguished portraits, mostly of women. Chief among these is the group representing Mrs. C. K. Butler and two children. His portrait of D. Croal Thomson, the connoisseur, must also be mentioned. His work is admirable in composition and drawing and remarkably original in treatment. Of his figure compositions, "The Mirror" is perhaps the finest; this, together with a landscape, "The Rainbow," was selected for the British Collection at the International Exhibition of St. Louis, 1904. Two pictures of his were also selected for Messrs. Agnew's notable exhibition of Independent Art in 1906. The permanent collections of Melbourne and Perth in Australia each possess an example of his work, entitled respectively "The Japanese Gown" and "Yacht Race, Cowes"; the art gallery at Cardiff also includes one of his pictures. His portrait of himself may be seen in the unique collection at the Uffizi Gallery in Florence. He has also done many paintings for decoration, of which the most notable are those in Bourton House, Streatham.

Steevens, GEORGE, Shakespearean scholar, was born in Poplar, London, on May 10th, 1736, and was educated at Kingston-on-Thames, Eton and King's College, Cambridge. He was of well-to-do family, his father being first a captain and afterwards a director of the East India Company, and he was thus enabled to gratify his literary tastes to the full. He made a particular study of Shakespeare's works and times, and in 1766 issued twenty of the plays in four volumes, in which his great knowledge of early English literature was evinced. He contributed largely to various popular compilations of the day. He was on very bad terms with his contemporaries, being of a spiteful and most unamiable nature,

although Dr. Johnson, who tolerated him indulgently, argued that he would do no man an essential injury. He died at Hampstead on January 22nd, 1800.

Steganophthalmata, the covered-eyed Medusæ, embracing those jelly-fishes whose sensory tentaculicysts are covered with flaps proceeding from the margin of the disc. It contains some of the commonest jelly-fishes. The uncouth-looking name is merely a transliteration of the Greek *steganos*, "covered," and *ophthalmos*, "eye," and distinguishes the division from the *Gymnophthalmata*, or naked-eyed Medusæ.

Stein, HEINRICH FRIEDRICH KAPL, BARON VON, statesman, was born at Nassau, in Prussia, on October 26th, 1757. He studied at the University of Göttingen, after which he entered the civil service and rapidly rose to a high position. In 1797 he was made president of the Westphalian Chambers, and in 1804 entered the Ministry. He resigned in 1807, owing to a slight misunderstanding, but within a few months was afterwards called upon to accept the office of Prime Minister on his own terms. His success in that capacity and his zeal for reform did not please Napoleon, who required his dismissal, a request with which, in the circumstances, Frederick William III. had no alternative but to comply. Stein advocated compulsory conscription and the abolition of serfdom, and did much to promote equality among the people. In 1812 he was of great assistance to the Emperor Alexander at St. Petersburg, his firmness and discretion being strongly marked, while he did not allow himself in organizing resistance to Napoleon's schemes of spoliation and conquest both in Russia and Prussia. The spirit prevailing in the Congress of Vienna proving distasteful, he retired into private life and died on his estate of Cappenburg in Westphalia on June 29th, 1831. His great merit was that he was the first to recognise the necessity for a unified Germany, while at the same time he was prepared to concede the fullest measure of local self-government.

Steinbok, a name for the Ibx. [GOAT.] It is more commonly used of a small South African antelope (*Antilope tragulus*), which is fond of stony places, whence its name. It is 20 inches in height, with straight horns four inches long (none in the female), large outstanding ears, and the veriest stump of a tail. Its colour is reddish-brown, white below.

Stele, the axial cylinder of tissue arising from one strand of plerome or axial generating-tissue, in which the vascular tissue originates. Most stems have one such cylinder, and are monostelic; but polystely, or the possession of several such cylinders, is frequent among Pteridophyta. The primitive stele may break up into several schizosteles, as in the stem of *Equisetum*, the *Nymphaeaceæ*, etc., and in many leaves. The portion of the stele given off to a leaf is termed the meristele. The stelar tissue, whether united or schizostelic, is marked off from the extra-stelar ground-tissue by the endo-

dermis. The stele may contain one or many vascular bundles.

Stellenbosch, a town of Cape Colony, South Africa, 25 miles E. of Cape Town. It is one of the oldest European settlements and dates from 1681. The climate is healthy and the splendid oaks afford grateful shade from the heat. It has Victoria College, the Theological Seminary for training students for the ministry of the Dutch Reformed Church, agricultural and mining schools and is largely a residential quarter. Pop. (estimated), 6,000.

Stem, the ascending portion of the axis of a plant, bearing leaves as lateral appendages. In the *Thallophyta* there cannot be said to be either stem or leaf, and in higher plants, as in the case of the liverwort, or even the duckweeds (*Lemna*), the stem is sometimes represented by a flat, green, cellular, and very unstem-like expansion. Stems differ from roots (i) in growing generally upwards, away, that is, from the centre of gravity; (ii) in growing at the apex without any cap of dead cells, though this growing-point is generally overlapped by rudimentary leaves forming a terminal bud; (iii) in bearing leaves as lateral appendages differing from themselves in structure; and (iv) in giving off their branches exogenously—i.e., from more superficial layers of tissue than roots do. Stems may grow horizontally, but even then commonly bend upward at their growing-points, whilst even drooping branches generally take an ascending direction as they first leave the stem. The functions of a stem are: (a) to support the leaves and flowers, and connect the former with the roots, the other main organs for taking in food; (b) when still young and green, to assimilate, like the leaves; and (c), more especially in perennials, to act as a food reservoir. The physiological utility of branching stems would seem to be the exposure of leaves and flowers to as much air and light as possible; and it is in stem-structures that many of the processes, not only of food-transfer from assimilating organs to growing parts take place, but also those of what is called food "elaboration." In the higher plants the stem originates in the plumule of the embryo, and as the stem elongates it remains terminated by a similar bud, as long as growth continues. The lower leaves of the bud, as it now develops into a shoot, become separated in succession, the points at which they spring from the stem being termed nodes, and the lengths of stem between them, internodes. Some plants, such as the primrose, are misleadingly called aculeascent, or stemless, because their stems are so short and the internodes so little developed that the leaves are crowded together in a rosette. The stems of the great groups of the higher plants differ markedly in internal structure. Those of mosses are mainly cellular, with an ill-defined epidermis without stomata, and the mere rudiment of a central vascular axis. Those of ferns, known as acrogenous, have very short internodes, and are covered with the scars of fallen leaves: they are generally cylindric, crowned with a circle of leaves and seldom branched; and, in addition to cortical and

other sclerenchyma, have a circle of closed fibro-vascular bundles surrounding a soft mass of fundamental tissue, and sending out branch bundles into the leaves. Monocotyledons have stems also mostly cylindric and unbranched, with no separable bark, and hardest near the outside. They may have a distinct epidermis and primary cortex, and contain numerous scattered closed bundles which bend inwards from the roots and outwards into the leaves. There are, however, several modifications of this type. Grasses, of which the Bamboos are gigantic tropical representatives, have mostly hollow internodes with straight bundles, which intercross at the nodes. Such a stem is called fistular, and sometimes a culm. The unbranched stem of a palm or a tree-fern is called a caudex. Most Monocotyledons have a considerable amount of sclerenchymatous conjunctive tissue round their bundles. Some few arborescent Liliaceæ, such as *Aloc* and *Dracæna*, develop additional bundles in a merismatic pericycle. All Dicotyledons have at first, as annuals always retain, a succulent, herbaceous stem, with a distinct epidermis, and generally a green hypoderm. In woody plants, mostly perennial, the epidermis is soon thrown off and replaced by the periderm, beneath which will be the phellogen and phellogen, the central medulla shrivels, and the bulk of the stem is made up of the ring of open fibro-vascular bundles, separated by the medullary rays, and made up of annual rings of xylem within and of phloem outside the line of cambium. If a woody plant has one main stem at least ten or twelve feet high it is called a tree; whilst if it branches freely near the ground it is a shrub. Though usually round in section, the stem is sometimes angular; being triangular, for example, in sedges, and square in many Labiate. In other cases the leaves are, so to speak, continued down the sides of the stem, which is then termed winged, as in some thistles. In surface the stem may be smooth, or, technically, glabrous; furrowed, hairy, downy, bristly or setose, that is having stiff hairs; or prickly, as in the rose. In duration stems may be annual, biennial, or perennial; but a large number of plants known as herbaceous perennials have perennial underground stems, but send up branches above ground that are annual, dying down each winter. Other forms of aerial stem, such as the runner, the offset, the sucker, the thorn, some tendrils, and the phylloclade, together with most forms of underground stem, such as the rhizome, corn, bulb, and tuber, have been separately described in such cases as seemed to call for further elucidation.

Stenness, or STENNIS. [STANDING STONES.]

Steno, NICOLAS, anatomist, was born at Copenhagen in 1638, and was one of the pupils of Bartholin. He travelled in Germany, France, and Italy, and became a Catholic. He was appointed Professor of Anatomy at Copenhagen, but finally entered the Church, and was made a bishop by Innocent XII. He died at Schwerin on November 25th, 1687. He published several great works on anatomy, notably his *Observations on the Muscles and Glands* and *The Anatomy of the Brain*. Sir William Turner says that he

"described with accuracy the lacrymal gland and passages, and rediscovered the parotid duct."

Stentor, a herald with the Greek army before Troy, whose voice was as powerful as that of fifty other men together. Hence we have the word "stentorian" applied to the lungs or voice.

Stephanite, an ore of silver consisting of a compound of that metal with sulphur and antimony. It forms clear bright-red crystals, and occurs chiefly in the Harz, at Freiberg, and in Norway and Hungary; but is found to a smaller extent in most silver ore deposits.

Stephanotis, a small genus of Asclepiadaceæ, natives of Madagascar, consisting of climbing shrubs with leathery leaves and umbels of beautiful fragrant salver-shaped flowers, which are largely cultivated in stoves for their beauty.

Stephen, KING OF ENGLAND, was the third son of Stephen, Count of Blois and Chartres by Adela, daughter of William the Conqueror, and was born in or about 1097. On the death of his uncle, Henry I. (1135), he claimed the English Crown, although he had been amongst the foremost of the barons in swearing to acknowledge Henry I.'s daughter Matilda as Lady of England and Normandy. The Scots harassed him greatly, but they were finally defeated at the Battle of the Standard (1138), and by the aid of his brother, the Bishop of Winchester, he contrived to keep in restraint the recalcitrant nobles who troubled him periodically throughout his reign. In 1139 Matilda landed at Arundel and was soon mistress of the West. But London stood faithfully by Stephen, who at Lincoln (1141) performed prodigies of valour and almost succeeded, single-handed, in avoiding capture. But he yielded at last to numbers and was sent to Matilda, who had him imprisoned in Bristol. She was now acknowledged as sovereign, but had not the wit to cope with the crisis. She estranged the people by her harsh rule and exchanged Stephen for Robert, Earl of Gloucester. No doubt her affection for Robert, her half-brother and one of her safest advisers, prompted a step otherwise most imprudent; for Stephen was crowned again at Canterbury before the end of 1141. Matilda's cause was stoutly maintained by Earl Robert, in spite of her reverse at Oxford (1142), and he defeated Stephen at Wilton in 1143. Slowly but surely, however, the King strengthened his position and Matilda and her husband, Geoffrey of Anjou, transferred to their son Henry the duty of asserting his claim to the throne. This task Henry undertook in 1149. He was not successful at first, but in 1153 Stephen's spirit was broken by the death of his wife and son and strenuous quarrels with the Church, and he negotiated a treaty at Wallingford, which arranged that he was to remain King for life, that Henry should succeed him and that meanwhile Henry should carry on the actual work of government as his adoptive son, but in his name. Henry of Anjou had not to wait long for the crown, for Stephen died at Dover on October 25th, 1154.

Stephen, SIR JAMES, historian, third son of James Stephen (1758-1832), Master in Chancery,

an abolitionist, author of an exhaustive work on *Slavery*, and friend and brother-in-law of Wilberforce, was born at Lambeth, on January 3rd, 1789. He entered Trinity Hall, Cambridge, in 1806, was called to the bar at Lincoln's Inn on November 11th, 1811, and took the degree of LL.B. in 1812. In the following year he was appointed counsel to the Colonial Office and in 1814 married Jane Catherine, daughter of John Venn, rector of Clapham. Relinquishing his private practice when he became permanent counsel to the Colonial Office and to the Board of Trade in 1825, he was appointed, in 1836, Under-Secretary of State for the Colonies which, it was said, he literally ruled, and his great influence won for him the nicknames of "King Stephen" and "Mr. Mother-Country Stephen." He prepared the measure for the abolition of slavery, passed in 1833, "breaking the Sabbath," his son says, on this and on one other occasion only, to expedite the dictation of an elaborate Bill of sixty-six sections whereby a year's delay was obviated. In 1847 he resigned his office when he was made K.C.B. and a Privy Councillor. He became, in 1849, Regius Professor of Modern History at Cambridge, where he delivered his *Lectures on the History of France* which gained the praise of De Tocqueville. *Essays in Ecclesiastical Biography*, written as a relaxation during his official career, and collected in 1849, is his best-known work. His health failing, he went to Homburg in 1859 and died on the return journey at Coblenz on September 14th. A conscientious official, he set, his son Sir Leslie Stephen said, "a constant example of absolute devotion to duty," "one of the conspicuously good and able men of his generation."

Stephen, SIR JAMES FITZJAMES, judge and jurist, was born in Kensington, London, on March 3rd, 1829. He was educated at Brighton, Eton (which he disliked), King's College, London, and Trinity College, Cambridge, and was called to the bar in 1854. In 1868 he became a Q.C., and from 1869 to 1872 was a legal member of the council of the Indian Government. In 1875 he was made Professor of Common Law in the Inns of Court, resigning in 1879 on being appointed Judge of the High Court. His works on law are of great value. His most notable work, *A History of the Criminal Law of England* appeared in 1883. It had been led up to by his *General View of the Criminal Law of England*, which had been published twenty years before, and his *Digest of the Criminal Law* (1877). Others of his books were *Essays by a Barrister* (1862), *Liberty, Equality, and Fraternity* (1873), *A Digest of the Law of Evidence* (1876), *A Digest of the Law of Criminal Procedure in Indictable Offences* (1883), *The Story of Nuncomar and Sir Elijah Impey* (1885), and three series of *Horn Sabbata*. The last were a reprint of articles contributed to the *Saturday Review* from 1855 onwards. Stephen was the powerfulest leader-writer in London, and his articles during the five years that he was a member of its staff were the chief feature of the *Pall Mall Gazette* (1865-9). He died at Ipswich on March 11th, 1894. His second son, JAMES KENNETH STEPHEN ("J. K. S."), was born

on February 25th, 1859, and held out the promise of a very brilliant career, which was unfortunately cut short by the result of an accident, and he died on February 3rd, 1892. His volumes of fugitive verse *Lapsus Calami* and *Quo Musa tendis* met with an instantaneous success.

Stephen, SIR LESLIE, first editor of the *Dictionary of National Biography*, and brother of the preceding, was born at Kensington, London, on November 28th, 1832, and was educated at Eton, King's College, London, and Trinity Hall, Cambridge. He was for a time Fellow and Assistant Tutor at Trinity Hall, but ultimately came to London and devoted himself to literature. He was a frequent contributor to the *Pall Mall Gazette* and the leading monthly magazines, and in 1871 was appointed editor of the *Cornhill*. In the same year he published *The Playground of Europe*. In the field of philosophy he established a reputation by his *History of English Thought in the Eighteenth Century* (1876), *Essays on Free Thinking and Plain Speaking* (1879), and *The Science of Ethics* (1882). In the last-named year he retired from the *Cornhill* chair to take up the editorship of the *Dictionary of National Biography*. This did not absorb all his energies, for he wrote in 1885 a *Life of Henry Fawcett*, and after he withdrew (1891) from the *Dictionary*, he published *An Agnostic's Apology* (1893), *Life of Sir James Fitzjames Stephen* (1895), *Social Rights and Duties* (1896), *Studies of a Biographer* (1898), and *The English Utilitarians* (1900). To the series of "English Men of Letters" he contributed the volumes on Swift, Pope, Johnson, and George Eliot. He was elected President of the London Library in 1895, and in 1902 was created K.C.B., one of the Coronation honours. His first wife was the youngest daughter of W. M. Thackeray. He died in London on February 22nd, 1904.

Stephens, FREDERIC GEORGE, art critic, was born at Walworth, London, on October 10th, 1828, and studied art at University College Schools and the schools of the Royal Academy. He was invited to become one of the seven founders of the Pre-Raphaelite Brotherhood, established in 1848. This shows that he must have manifested not only very decided art taste and knowledge, but also a capacity to select the vital and reject what was merely conventional and adventitious. At the same time it is admitted that beyond two or three small portraits he did nothing of note and his technique was deficient. He probably recognised this himself, for he ultimately withdrew from the practice of art and became in 1860 the art critic of the *Athenæum*, thus unconsciously confirming Benjamin Disraeli's famous sneer about critics. Stephens had an attractive person and fine face and sat for the Ferdinand of J. E. Millais' "Ferdinand and Ariel," and the Jesus of Ford Madox Brown's "Christ washing Peter's feet." He was the honorary secretary of the Hogarth Club which was dissolved in 1861. Besides art criticism he acted for a period as instructor in art to University College School, London, and was also engaged in the Print Department of the British Museum, in

connection with which he compiled an invaluable *Catalogue of Prints and Drawings (Personal and Political Satire)*, issued in 1870-7. In 1883 he published a book on *Sir Edwin Landseer*, which, so far as the facts of the painter's career are concerned, was unfortunately faulty in many particulars. Much of his best work was done for the *Athenæum*. It was not merely criticism of exhibitions and reviews of books. His series of articles, for example, on "The Private Collections of England" possessed permanent value. He retired from this post after 40 years' incessant labour, and died in London on March 9th, 1907.

Stephens, the incorrect English form of the name Estienne, a celebrated family of French printers of the 16th and 17th centuries. It was founded by Henri Estienne (1460-1520), who gained a great reputation for the beauty of his typography. The more famous members of the family were his son Robert and his grandson Henri (II.). ROBERT ESTIENNE was born at Paris in 1503 and died at Geneva on September 7th, 1559. He was an eminent scholar, and began to print about 1525, and issued a large number of learned works, many of which were edited by himself. Perhaps his most famous productions are his editions of the Bible, for which he was persecuted and driven from France by the narrow-minded doctors of the Sorbonne. He favoured the Reformation, and settled in Geneva. His most notable innovation was his division of the Bible into chapter and verse, now universally adopted. His son, HENRI ESTIENNE (born in Paris in 1528; died at Lyons in March, 1598), devoted himself chiefly to the classical authors, and issued magnificent editions of Homer, Terence, Plato, Xenophon, Æschylus, Herodotus, and other Greek writers. His greatest work is, however, his valuable philological study, *Thesaurus Lingua Græca*, which appeared in five folio volumes in 1572. PAUL ESTIENNE (born in Geneva in January, 1566; died about 1627) was compromised in the famous affair of the Escalade (December, 1602). He was imprisoned and sent into exile, and his property was confiscated. Permitted to return to Geneva in 1619, he never regained his former prosperity and sold his business to the brothers Clouet. He is believed to have retired to Paris. His son ANTOINE ESTIENNE (born at Geneva in 1592; died in Paris, 1674) maintained the reputation of the family as a printer, but discredited its independence of spirit by renouncing Protestantism.

Stephens, JAMES, Fenian leader, was born in Kilkenny, Ireland, about 1825, and began life as a civil engineer. When the rebellion of 1848 broke out, he threw himself into it with enthusiasm, and was wounded in the Ballingarry affair. He escaped to Paris, where he lived for some years, and returned in 1853, to start the Fenian movement in conjunction with O'Donovan Rossa and others. He was the acknowledged chief, or Head Centre, as he was designated, of the conspiracy which made alarming progress, and founded *The Irish People*, a paper in connection with it. This was seized and Stephens and others were arrested in

1864, and confined in Richmond Gaol, Dublin. He escaped in a remarkable manner and fled to Paris, while the rest were sentenced to long terms of penal servitude. Although a reward of £2,000 was offered for his apprehension, Stephens avoided arrest. He supported himself in Paris by teaching English, and by his translations of some of Charles Dickens's works into French. In 1891 he was permitted to return to Ireland, and died at Blackrock, Dublin, on March 29th, 1901.

Stephenson, GEORGE, inventor and founder of railways, the son of a fireman at a colliery, was born at Wylam, 8 miles west of Newcastle-on-Tyne, Northumberland, on June 9th, 1781. He was employed in the mines from childhood, and gradually worked himself up to the position of brakesman, where his inventive genius soon began



GEORGE STEPHENSON.

(After the painting by H. P. Briggs, R.A.)

to show itself. He made some small improvements in the working of the horse engine, meanwhile educating himself as well as he could, and trying his hand at the adjustment of mechanical contrivances. In 1815 he invented a useful safety lamp, for which he was (in 1818) presented with 1,000 guineas at a public banquet in Newcastle. Independently of each other, Stephenson and Sir Humphrey Davy had been working on the same subject and a bitter controversy ensued about the priority of the invention. The safety lamp ultimately was named after Davy, but there is no doubt that both had reached a similar result by different methods practically simultaneously and there is no reflection on the good faith of either. Previously he had thought over the possibility of constructing a locomotive, and in 1814 made a trial of one at Killing-

worth. Though a very simple affair it worked well, and in the following two years he made others, each being an improvement on the preceding. His fame extended, and he was appointed manager of the Hetton Colliery Railway, where his engines were used (1822). He was appointed engineer of the Stockton and Darlington Railway, for which he laid the line and constructed the locomotives and which was opened in 1825. He next constructed the Liverpool and Manchester Railway (opened on September 15th, 1830, when William Huskisson was fatally injured), in connection with which Stephenson triumphantly surmounted two remarkable engineering difficulties—the crossing of Chat Moss and the Olive Mount cutting. Thereafter he was associated with the construction of the principal lines in the north and midlands of England, especially the Grand Junction connecting Birmingham with Liverpool and Manchester, Manchester to Leeds, Birmingham to Derby, Normanton to York, Sheffield to Rotherham, and Derby to Leeds. He died at Tipton House, near Chesterfield, on August 12th, 1848. The speed of his early engines was from six to eight miles an hour, and when his famous "Rocket" (1829) attained a speed of twenty-nine miles an hour, great wonder was expressed.

Stephenson, ROBERT, engineer, son of the preceding, was born at Willington Quay, near Newcastle-on-Tyne, on October 16th, 1803. He was educated at the village school of Long Benton and Dr. Bruce's academy in Newcastle, and, after serving a short apprenticeship at Killingworth colliery and helping his father in the survey of the Stockton and Darlington Railway, he attended science classes in Edinburgh University for a few months in 1822. He then settled down in his father's locomotive works at Newcastle, but his health giving way (his mother died of consumption in 1806 while he was little more than a baby), he proceeded, in 1824, to Colombia in South America, to superintend the gold and silver mines. On his return to England (1827) he undertook an active part in the management of the factory and also assisted his father in the construction of several lines. He became engineer for the line from London to Birmingham, which was begun in 1833 and completed in 1838 and is memorable as the first railway to the metropolis. (It now forms part of the system of the London and North Western Railway Company.) He acquired lasting fame for his bridges, the most celebrated of which are the magnificent High Level Bridge at Newcastle, the Border Bridge at Berwick, and the Britannia Bridge across the Menai Strait, the Victoria Bridge over the St. Lawrence and two over the Nile. For the Britannia and Victoria Bridges he invented the tubular plate principle which received from the French exhibition of 1855 the great gold medal of honour. He represented Whitby from 1847 till his death, which took place in London on October 12th, 1859. He opposed Isambard Kingdom Brunel in the battle of the gauges and defended the locomotive system of traction against Brunel's atmospheric railway. On both points experience proved

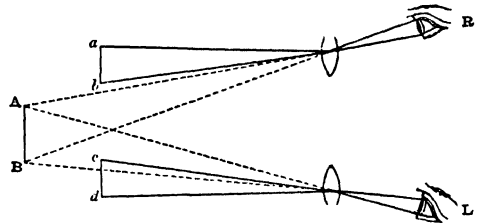
m to be right. On the other hand, he opposed the House of Commons the project for the Suez canal.

Steppe, a vast tract of level treeless land, characteristic especially of much of the surface of Russia in Europe and Asia. In point of fact, the steppe region may be said to extend from the borders of Holland and to end almost at the Pacific, thus passing through Northern Germany, Central and part of Southern Russia, and, leaping the Urals, Northern Siberia, or a distance of 4,500 miles. Though the absence of trees is a distinctive feature, forests are found occasionally on the banks of rivers and lakes, while here and there are barren stretches of sand and patches covered with exuded salt. Undulating hills and mountainous ridges sometimes break the monotony of the dreary expanse. The scanty vegetation maintains immense flocks of sheep, herds of cattle, droves of horses and camels and a population is almost wholly nomadic. Baron von Humboldt (1769-1859) introduced the term "steppe" in his *Ansichten der Natur* (1808), in which there is a chapter entitled "Steppen und Wüsten" ("Steppes and Wastes"). Though the word has been used of plains in other countries, it is highly desirable to reserve it for a description of those of the Russian Empire.

Stereom, the collective name for all the tissue, whether sclerenchyma or collenchyma, which serves mechanically supporting tissue to the various parts of plants. Collenchyma often serves this purpose in leaf-stalks and herbaceous stems. As illustrating the varied disposition of the stereom, mention may be made of the variously scattered strands of sclerenchyma in the ground tissue of stems; of the circle of numerous crescentic strands in the cortex of *Arum maculatum* (the cuckoo pint, or lords-and-ladies, or wake-robin of popular parlance); of the continuous pericyclic ring in *Allium vineale* (the crow garlic); of the podermal and conjunctive strands in the hollow stem of *Juncus glaucus*, one of the rushes; and of the sheath of conjunctive stereom general in monostyledonous stems.

Stereoscope. Since our two eyes are separated by a definite distance, it follows that near objects will produce slightly different images on the two retinas. The two pictures are mentally ended, and the combination gives us the perception of solidity or relief. Sir Charles Wheatstone (1802-75) was the first to point out the importance of this double vision, and illustrated its effect by means of an instrument he called a stereoscope, which was afterwards improved by Sir David Brewster (1781-1868). Two pictures are drawn of an object from two near but different points of view. They represent the pictures formed by the two eyes. The one picture will show a little more the right side of the object, just as would be seen by the right eye; the other picture will show more the left side. The two pictures are then placed side by side, two halves of a box, over each of which a half is placed. The right eye views the one picture, while the left eye sees the other, a partition down

the centre of the box preventing either eye from seeing what was intended only for the other. The two half-lenses slightly magnify the picture, and, what is more important, cause the two virtual images to coincide as nearly as possible. Thus,



rays from the object *a b* to the lens enter the eye *R* as though they came from *A B*. In a similar way the other lens forms an image of *c d* which appears to the eye *L* to be superposed upon *A B*. The result is that the observer sees a solid object instead of a plane picture. The whole thing stands out in relief and looks exactly like any actual still dimensional object. The inability of a person to detect which eye sees an object is exhibited by the stereoscope. A piece of white paper may be put in one side, and a paper with a dot on it in the other; the observer cannot tell in which side the dot occurs—i.e., he does not know which eye sees it.

Stereotype, a duplicate face in one piece of a quantity of type set up for printing. The plate is produced by taking a mould in plaster, clay, or papier maché and running metal into it, or by the electrotype process. The great advantage of stereotyping is that it enables the movable types to be released for other work. For instance, after this page is passed for press by the corrector, a mould might be taken of it in papier maché and the type would then be set free for the composition of the next page. Another advantage is that the process prolongs the life of the types. Stereotype plates were first made by William Ged (1690-1749) at Edinburgh in 1725. The 3rd Earl Stanhope and Andrew Wilson, the foreman of his press, invented a process of stereotyping, which was acquired by the Clarendon Press of Oxford in 1805.

Sterling, JOHN, author, was born at Kames Castle in the island of Bute, Scotland, on July 20th, 1806. His father, EDWARD STERLING (1773-1847), native of Waterford, received the appellation of "The Thunderer" whilst editing *The Times*. John was educated in Greenwich, Glasgow University and Trinity College, Cambridge. For a few months in 1828 he edited *The Athenæum*, along with Frederick Denison Maurice, and became a disciple and friend of Coleridge and Wordsworth, whose influence is discernible in his writings. He married in 1830, and from the state of his health was obliged to go to St. Vincent for a couple of years. Soon after his return to England he published (1833) his novel of *Arthur Coningsby*, which

made no mark, and in 1834 entered the Church with a view to taking up a curacy at Hurstmonceaux in Sussex, where his former tutor, Julius Charles Hare, was rector. But he retired in 1835, having no call to the orthodox religious life. In 1837 he published his poem of *The Squire's Daughter* and also began his connection with *Blackwood's Magazine*, in which appeared his "Palace of Morgana," "The Onyx Ring" and "Crystals from a Cavern." His health was now undermined by consumption and he pursued his work under great discomfort. In 1841 his poem *The Election* was brought out and in 1843 his undramatic tragedy of *Strafford* was published. He died at Ventnor on September 18th, 1844, and was buried in the beautiful little churchyard at Bonchurch. Sterling lives not so much in and by what he wrote, but because he had inspired in Thomas Carlyle a feeling of warm friendship which induced Carlyle to produce a biography the beauty of which may go far to give Sterling a place among the immortals.

Sterne, LAURENCE, author of *Tristram Shandy*, was the son of an army officer, and was born at Clonmel in Tipperary, Ireland, where his father



LAURENCE STERNE.

(After the painting by Gainsborough.)

was stationed, on November 24th, 1713. He was the great-grandson of Richard Sterne (1596?-1683), archbishop of York, and of very good family. His mother was a native of Clonmel. He was sent to Jesus College, Cambridge, for his education and graduated M.A. in 1740. He was ordained, and received through his uncle, the Rev. Dr. Sterne, a living at Sutton, to which was added subsequently a prebend at York. He also obtained later the rectory of Stillington (1743) and the curacy of Coxwold (1760), where he lived for some years quietly enough. His wit was maturing slowly, and few of his neighbours were aware of his possession

of that unique quality of humour which he afterwards shed profusely in all his works. Occasionally, however, his sermons approached levity, and were sometimes marked by that suggestiveness which is peculiar to him. His only humorous production of this period was a work entitled *The History of a Watch Coat*, a satire on a voracious church dignitary at York (which, however, was not published till the year after its author's death). The year 1760 (January 1st) is notable as the date of publication of the first two volumes of his *Tristram Shandy*. The work immediately attracted much attention, and was praised and blamed in all directions. Its obscenity shocked many, its extraordinary humour and feeling delighted others, and its art of discursiveness created surprise everywhere. Emboldened by the success of the first two volumes, Sterne went on with the work, producing a couple of volumes now and again, till the completion of the work in 1767. In 1768 he issued his *Sentimental Journey*, which won instant popularity, and made even more admirers than *Tristram Shandy*. It has remained a classic to this day, and though not free from grossness, it is less diffuse and contains many exquisite touches. He died in London on March 18th, 1768. A host of imitators of Sterne have arisen in England, France, and Germany, but they rarely reach the height of Sterne at his best. His *Sermons*, which were published before his *Sentimental Journey*, whatever their faults may be, are at least not dull or heavy. His portrait was painted by both Sir Joshua Reynolds and Thomas Gainsborough, the former being the finer.

Sternhold, THOMAS, versifier of the Psalms, was born at Southampton, according to some, at Awre in Gloucestershire, according to others, but the year of his birth is unknown. He is said to have entered Christ Church, Oxford, and the first definite date of his career is 1538. During his life, of which little is known, he held some important offices, including that of Groom of the Robes to Henry VIII. and Edward VI. In 1548 he issued, in conjunction with John Hopkins, his version of the Psalms, and this has been often reprinted. It is the only work which has handed down Sternhold's name.

Sternum, the breast-bone in man and many other vertebrate animals. It occurs in the middle line of the ventral aspect and chiefly in the thoracic area of the body. In most mammals it consists of an anterior piece, or handle, of several segments constituting the body of the sternum or mesosternum, and of a terminal piece, the ensiform cartilage. In the whales and manatees it is much reduced or even rudimentary and is lacking in serpents. In birds it is found as a large single bone, highly modified in shape and function, in relation to the muscular apparatus of flight. It is rattle, or raft-shaped, in the struthious birds (Ostriches) and carinate, or keel-shaped, in all other birds. [SKELETON; RIBS.]

Stethoscope, the instrument employed in auscultation of the chest. [AUSCULTATION.] The

stethoscope consists of a perforated cylinder expanded at either end—on the one hand for adaptation to the ear of the observer, on the other for application to the chest-wall of the patient. It is usually made of wood. Of late years the binaural stethoscope has been largely used, such an instrument being applied to both ears of the auscultator, and the sounds from the chest examined being conducted by flexible indiarubber tubes.

Stettin, the capital of Pomerania, and the third in importance of the seaports of the German Empire, 80 miles N.E. of Berlin. It is situated on the left bank of the Oder at its mouth in the Stettiner Haf, which, with an area of nearly 300 square miles, affords safe anchorage for most large vessels, though rather shallow (its depth does not exceed 15 feet save in places). Swinemünde (10,251), at the entrance to the Haf, is its outport. Stettin has become a very important naval station, possessing an arsenal, docks, building-sheds, forges, and a school of navigation, and being strongly fortified. There are also factories for machinery, cement, soap, and chemicals. The shipbuilding yards are amongst the most extensive in the world. It was at the yards of the Vulcan Company (established in 1851) that the famous Atlantic liners *Kaiser Wilhelm der Grosse* and *Deutschland* were built, the former taking the Atlantic record both on its outward and homeward journey in 1897 and the latter surpassing this performance, both westwards and eastwards, in 1900. Other gigantic liners and several line-of-battle ships have been constructed at Stettin. Though not a handsome town it contains several buildings of interest, such as the church of St. Peter and St. Paul, the oldest in Pomerania; the 13th-century church of St. James; the old ducal castle, now utilised as a Government office; the old and new town halls, and the Königsthor and Berliner Thor. Pop. (1900), 210,680.

Stevens, ALFRED, sculptor and painter, was born on January 28th, 1818, at Blandford, Dorsetshire, England, in humble circumstances. At the early age of eight years he had acquired some skill with pencil and brush, and in 1833 he had the good fortune to win the sympathies of the Hon. and Rev. Samuel Best, who sent him to Italy and enabled him to remain there for nine years. In Italy he copied the works of the great masters of painting and of decoration. He also gained much practical experience in the studio of the Danish sculptor Thorwaldsen, in Rome. In 1843 he returned to England, settling in London, where he obtained an appointment in the Government School of Design, then held at Somerset House, resigning his position in 1847. During that period he made many designs, notably those for a door and doorway for the School of Mines in Jermyn Street, London. In 1848 he accepted the position of chief designer to Messrs. Hoole and Robson of Sheffield, which he retained for two or three years and then returned to London. In 1855 it was decided to erect a monument of the Duke of Wellington in St. Paul's Cathedral, and artists of all nations were invited to compete. Stevens's design was rejected. He received only a minor

prize of £100, and that through the intervention of the one artist on the Commission. On an examination of the various designs from a practical point of view, it was found that the design sent in by Stevens was the only one that would meet the case. In 1858, Lord John Manners (afterwards Duke of Rutland), whose taste was undoubted, became First Commissioner of Works. Acting entirely on his own initiative, he commissioned Stevens to carry out the work. Originally a sum of £20,000 had been voted for this purpose, but it was decided to reduce this by £6,000 in order to award compensation to the first and second prize winners. The lamentable bungling of the whole business shows the futility of official meddling with matters of art. In spite of many objections and under great difficulties Stevens began the work in 1859, having taken a large studio in Hampstead for the purpose. The work was barely completed on his death sixteen years later. This great work consists of a sarcophagus supporting a recumbent figure and surmounted by a canopy, the whole crowned by an equestrian figure of the Duke. At the sides are two groups representing Valour and Cowardice, Truth and Falsehood. In 1862 he designed the Certificate of Honourable Mention for the Commissioners of the International Exhibition. During the same year he made designs for the decoration, in mosaic, of one of the great spandrels between the arches supporting the dome of St. Paul's Cathedral. One of these designs representing the prophet Isaiah is now in the Tate Gallery. On his death a complete scheme for the decoration of the dome was purchased by the St. Paul's committee. He also produced a scheme for the decoration of the dome of the Reading Room in the British Museum for Sir Robert Smirke, but the design was never executed. Stevens decorated many notable houses, chief among them being Dorchester House, Park Lane, London, and Deysbrook Hall, Liverpool. He died on May 1st, 1875. Stevens was entirely in sympathy with the ideas of the Florentine and Venetian masters of decoration during the Italian Renaissance of the 14th, 15th, and 16th centuries. He painted a few portraits, of which that of Mrs. Collman may be seen in the Tate Gallery, London.

Stevens, ALFRED, painter, was born at Brussels on May 11th, 1828. He came of an artistic family. His father, a soldier, had a fine collection of pictures. His brother Joseph was a distinguished painter of animals, whilst Arthur, another brother, was an art critic and curator of the gallery of the King of the Belgians. Alfred began his studies at Brussels under Navez, and at the age of seventeen proceeded to Paris, where he studied under Camille Roqueplan and also at the École des Beaux Arts. His first picture of importance, "The Wounded Soldier," now in the Museum at Hamburg, was exhibited at Brussels in 1851. In 1853 he made his *début* at the Paris Salon with a picture entitled "Masqueraders at the Dawn of Ash Wednesday," which received a medal and was bought for the Museum at Marseilles. In 1855 he exhibited the first of his series of paintings of

women for which he afterwards became famous. This was shown at the Salon and was called "At her House." In the same year he exhibited, at the Paris International Exhibition, four pictures, namely, "The Siesta," "The Beggarwoman," "The First Day of Devotion," "The Hunters of Vincennes," otherwise known as "Vagabondage." In 1857 he showed two fine works—"Spring" and "Consolation." The latter, one of the most beautiful of all his pictures, was purchased for the Ravené Gallery in Berlin for £240. About this time Robert Fleury tried to induce Stevens to give up painting women, offering him the medal of honour if he would do so. Stevens refused, saying "Stick to your medal, and I will stick to my genre." In 1861 he exhibited six pictures, entitled "All Happiness," "The Widow," "Bad News," "The Bouquet," "Surprise," and "The Convalescent." To the Salon of 1863 he sent "The Mother," "Uncertain Times," and "The Branches." In the same year he was made a Chevalier of the Legion of Honour. At the Paris International Exhibition of 1867 he was represented by a large number of pictures, including "India in Paris," afterwards in the collection of M. Schlesinger at Brussels, "The Parisian," "The Painter and his Model," now in the Museum at Brussels, "The Visit" (Cardon collection), "Morning in the Country," "Miss Fauvette," "Autumn Flowers," "The Bath," and others. For these he received a first-class medal and was made an Officer of the Legion of Honour. In 1868 he was commissioned to paint a grand official picture of the Imperial Family and the Court on the ice, for a sum of £600. He made a great many sketches, but finding the task very uncongenial he renounced the commission. During the following years he painted "The Lady in Pink," now in the Brussels Museum, "The Parisian Sphinx," now in the Museum at Antwerp, "The Japanese Mask," in the Durand-Ruel collection in Paris, "The Visit to the Studio," "The Passionate Song," in the Luxembourg Museum, Paris, "Fedora," and "The Drawing-Room," which was purchased by Vanderbilt for £2,000. In 1876 Leopold II. commissioned four pictures illustrating the four Seasons. In 1880 Stevens was ordered to the seaside, where he painted many marine subjects. In 1886 he wrote his "Impressions of Painting." On the death of the sculptor Eugène Simonis (1810-82) he offered to direct the Académie des Beaux Arts at Brussels, but that enlightened body refused his offer. He died in Paris on August 24th, 1906. Although he painted many romantic compositions and many marine pictures, Stevens was, *par excellence*, the painter of women, especially of the fashionable Parisian. His work is very elegant in composition and very beautiful in colour. His painting of textures has probably never been surpassed, but on the whole his work is, perhaps, too superficial to give lasting satisfaction and to secure permanent fame.

Stevens, GEORGE ALEXANDER, comedian and author, was born in London in 1710. Apprenticed to a trade, he soon gave this up as distasteful and went on the stage, travelling with companies for

some time without success. He next began to write for the stage, with little more profit; but at length, by his public entertainment called "A Lecture on Heads," a whimsical address being delivered each time he appeared, he became famous. He also published *The History of Tom Fool* (1760) and *Comic and Satirical Songs* (1772). He died at Baldock in Hertfordshire on September 6th, 1784. He wrote one or two fine songs, such as "Cease, rude Boreas, blustering railer," but "Hearts of Oak," attributed to him by some, is more usually ascribed to David Garrick. His periodical called *The Beauties of all the Magazines Selected* may be regarded as a forerunner of *The Review of Reviews* founded by W. T. Stead, while the posthumous publication *The Adventures of a Specialist, or a Journey through London*, by G. A. S. (1788), curiously anticipated the use of initials associated with the name of George Augustus Sala.

Stevenson, ROBERT, civil engineer, only child of Alan Stevenson, was born at Glasgow on June 8th, 1772. His father died when he was two years old and his mother, who was left in poor circumstances, married Thomas Smith, first engineer of the Scottish Lighthouse Board. Young Robert entered his step-father's office and studied civil engineering in Glasgow and at the University of Edinburgh. He made rapid progress. Smith, who entrusted him with many important works while he was still in his teens, took him into partnership in 1796 and gave him his eldest daughter Jean, by a former marriage, as wife. He succeeded his father-in-law as engineer to the Lighthouse Board, an office he filled for forty-seven years, during which period he planned and constructed twenty-three lighthouses round the Scottish coast. The most important of these was the famous Bell Rock tower situated on the northern side of the entrance to the Firth of Tay, fourteen miles from land on a reef of Old Red Sandstone rocks, submerged at every tide to the depth of twelve feet and formerly a frequent cause of shipwreck. On December 23rd 1800, Stevenson's design was submitted to the Board, but it was not until August, 1807, that opposition in Parliament and doubts as to its practicability were overcome and operations began. Rennie was appointed nominal chief. Knowing he had no experience in lighthouse construction, Stevenson disregarded his suggestions. He personally superintended its erection and after five years it was completed. The diameter at the base is 42 ft. diminishing to 15 ft. at the top; the weight of the material is 2,076 tons; the interior is divided into six storeys; the total height is about 117 ft., the light being shown 93 ft. above high water; and the total cost was £61,331. In 1814, with Stevenson and the Lighthouse Commissioners, Sir Walter Scott made a voyage round Scotland and visited the Bell Rock, on July 30th, when he wrote some lines in its album. Stevenson perfected the catoptric, or reflecting, system of lighting; he advocated the dioptric, or refracting, system and invented the intermittent and flashing lights made to show red and white alternately. The implements used in constructing the tower were also his inventions,

especially the balance and movable jib cranes into which ball-bearings were introduced. His practice was comprehensive, embracing bridges, harbours, canals, railways and roads. The magnificent eastern approach to Edinburgh was his work and George Stephenson acknowledged that from him he adopted the idea of malleable iron rails. He died in Edinburgh on July 12th, 1850.

Stevenson, ROBERT LOUIS, novelist, essayist and poet, was born in Edinburgh on November 13th, 1850. He was baptised Robert Lewis Balfour, but from the age of eighteen dropped the "Balfour" and spelt the "Lewis" in the French form, signing himself in full "Robert Louis."



ROBERT LOUIS STEVENSON.
(Photo: Falk, Sydney.)

Among his family and his intimates he was always known as "Louis." He was educated partly privately and partly at the Edinburgh Academy. What was to him of greater consequence was that he was an incessant and omnivorous reader. It was hoped that he would take to civil engineering, in which many of his family had earned high renown, chiefly as designers of lighthouses; and with this object he

attended classes at Edinburgh University. His health, however, delicate from the beginning, could not stand the strain of the workshop, and then (1871) he turned to Law, being called to the Scots bar four years later. For his health's sake he had already formed the habit of wintering abroad, principally in France, and this accentuated his love of travel and adventure. In 1876 a canoe tour in Belgium and France gave him materials for his *Inland Voyage* (1878), and a walking excursion through the mountains to Florac in 1878 suggested his *Travels with a Donkey in the Cévennes* (1879). In literary circles he was now regarded as the strongest force in letters of the day, in spite of his lack of years, and he wrote a good deal for periodical publications. The essays contributed to the *Cornhill* appeared as *Virginibus Puerisque* (1881). Attracted by the stage he collaborated (1879) with W. E. Henley in a play called *Deacon Brodie*, dealing with an 18th-century scoundrel of Edinburgh municipal life. In June, 1879, he went to California and next year married Mrs. Osbourne (a Dutch lady née Van de Grift), who had divorced her husband a few months before, and who proved a devoted helpmeet and nurse. *Treasure Island* (1882) introduced him to a wider public and during the following years he sought health in different countries. In 1883 and 1884 he was at Hyères; from 1884 to 1887 he was at Bournemouth (where he

called the house his father gave him "Skerryvore," after one of the best-known lighthouses designed by his uncle Alan Stevenson); from 1887 to 1888 he wintered in the Adirondacks and in 1888 and 1889 he was cruising amongst the lovely islands of the Pacific. In 1890 he bought a small property at Apia, one of the Samoan Islands, and on his estate called Vailima ("Five Rivers") he resided for the rest of his days. He died suddenly on December 4th, 1894, and next day was buried on the summit of Mount Vaea. The natives, with whom his relations were of the friendliest description, cut a path for the cortege through the virgin forest and bore his body to its resting-place. During the last twelve years of his life, considering the disabilities he laboured under physically and the rare quality of his work, his industry was remarkable. For to these years belong, amongst others, his *Child's Garden of Verses* (1885), *The Strange Case of Dr. Jekyll and Mr. Hyde* (1886), *Kidnapped* (1887), *Underwoods* (1887), a collection of verse, *Memoir of Fleeming Jenkin* (1887), *The Black Arrow* (1888), one of his least satisfactory stories, *The Master of Ballantrae* (1889), *Ballads* (1890), *Father Damien* (1890), a pamphlet-vindication of the unselfish labours of a priest amongst the lepers of the Sandwich Islands, *The Wrecker* (1892), *Across the Plains* (1892), and *Catriona* (1893), which, along with *Kidnapped* as a first part, forms the completed novel called *David Balfour*. After his death appeared *Vailima Letters* (1895), *Weir of Hermiston* (1896), *Songs of Travel* (1896), *St. Ives* (1897), finely finished by A. T. Quiller-Couch, and *Letters to his Family and Friends* (1899). Stevenson knew of but did not live to see the Edinburgh Edition of his works, projected by his lifelong friend and business adviser Charles Baxter, and edited by Sidney Colvin, who also edited the several volumes of his letters. A strong demand being manifested at a later date for another special edition of his works, in 1906 and 1907 Messrs. Cassell and Company brought out the Pentland Edition, under the editorship of Edmund Gosse. His mother's simple and unpretentious *Letters from Samoa* (1906) give a pleasant picture of his life in Samoa and his dealings with the natives.

Stevenson Road. [TANGANYIKA.]

Stewart, HOUSE OF, a noble Scottish family which has filled a large place in history. The form STUART is French, but there is no reason for adopting it in English-speaking countries, since the form Stewart indicates clearly the Steward or Chief Officer of the Crown. The line sprang from the Norman Alan Fitz-Flaald, who obtained a grant of Oswestry in Shropshire soon after the Conquest. He married Adelina, daughter of Ernulph de Hesding, and his second son, Walter, actively supporting the Empress Matilda, or Maud (niece of David I. of Scotland), in her contest with Stephen, entered the service of the Scots king, was made High Steward of Scotland, and rewarded with extensive grants in Renfrewshire, Teviotdale and Lauderdale. The Stewardship became hereditary in his family. The 1st High Steward died in 1177 and Alan, the 2nd High Steward, took part in the Third Crusade

and left a son Walter II., the 3rd High Stewart, who was the first to adopt the surname of Stewart. He was also Justiciary of Scotland and died in 1246. His eldest son Alexander, 4th High Stewart, was Regent during the minority of Alexander III. and commanded at the battle of Largs in 1263. His eldest son James, 5th High Stewart, was one of the six Regents after the death of Alexander III. and warmly aided Sir William Wallace in his efforts after independence. His eldest son predeceased him without an heir and his second son, Walter III., became 6th High Stewart. He was a strong supporter of Robert Bruce, fought at Bannockburn (1314) and successfully held Berwick against Edward II. (1319). He married Marjory, the only child of Robert Bruce by his first wife, Isabel, daughter of Donald, Earl of Mar. Their only child, Robert, succeeded to the throne, as Robert II. on the death of David II. without heir in 1371, and so the Crown came into the Stewart family. "It cam with ane lass," was the lament of James V., a lament because he feared it would go with a lass, his daughter, ill-fated Mary Queen of Scots. But he need not have feared, for Mary's son James VI. ascended the throne of England in 1603 and was thus the first Stewart king of England and also united the crowns of the two countries and closed a long period of strife and unrest. His grandson, James II., was the last Stewart king of England, though his daughters, Mary and Anne, both ascended the throne before the Hanoverian George I., "the wee wee German lairdie" of the Jacobite balladmonger and first of the House of Guelf, came to wear the crown in 1714. James II.'s son James Francis Edward (1688-1766), by his second wife Mary of Modena, is better known to history as the Old Pretender and the Chevalier St. George, and his grandson Charles Edward (1720-1788) as the Young Chevalier, the Young Pretender, the hero of so many lovely romantic songs. With the death at Rome of Prince Charlie's brother, Harry Benedict (1725-1807), who was raised to the purple in 1747 and was afterwards styled Cardinal York, the whole issue of James II. ceased to be.

Stewart, BALFOUR, physicist, was born in Edinburgh on November 1st, 1828, and was educated at Dundee and the Universities of St. Andrews and Edinburgh. He entered a merchant's office, but, developing a strong bent for physical science, gave up a commercial career, and, in 1856, became assistant observer at Kew. He then engaged in the researches on radiant heat which formed his most valuable contribution to science and which (in 1868) gained him the Royal Society's Rumford Medal. In 1859, being appointed Director of Kew Observatory, he turned his attention more particularly to meteorology and terrestrial magnetism and in 1862 was elected F.R.S. In 1870 he was called to the chair of Natural Philosophy in Owens College, Manchester, a position which he filled till his death at Ballymagarvey, his place near Drogheda, in Ireland, on December 19th, 1887. His best-known books were *Treatise on Heat* (1866), *Elementary Physics* (1870), *The Conservation of Energy* (1872) and *The Unseen Universe*. This last

was published anonymously in 1875. It was the result of a collaboration with Professor Peter Guthrie Tait of Edinburgh and attempted to prove the existence of the soul by deductions from a blend of theological postulates and current scientific doctrines. It attracted widespread attention.

Stewart, DUGALD, philosopher, was born on November 22nd, 1753, in Edinburgh, where his father, MATTHEW STEWART (1717-85) was Professor of Mathematics at the University. Dugald was educated at the Royal High School (then under the Rectorship of Alexander Adam) and Edinburgh University. Entering that of Glasgow in 1771, he returned to Edinburgh in the following year, and occupied his father's post as a deputy. Philosophy was, however, his chief and congenial study, and in 1778 he temporarily filled the chair of Moral Philosophy at Edinburgh, to which he was appointed in 1785, remaining in the position till 1810. His lectures gained him much fame, and he discussed political economy as well as his own subject proper. The first volume of his *Elements of the Philosophy of the Human Mind* appeared in 1792, the second in 1814, the third in 1827. Other works of his deserving of record are his *Outlines of Moral Philosophy* (1793), *Account of the Life and Writings of Adam Smith* (1793), and his *Philosophical Essays* (1810). His complete works were edited by Sir William Hamilton (1854-60). He died in Edinburgh on June 11th, 1828. He was not an original thinker of the first class, but owed his undoubtedly remarkable influence partly to his admirable gifts of teaching and partly to his high character, which drew towards him a number of young men of unusual talent.

Stewart, ROBERT, 2ND MARQUIS OF LONDON-DERRY, better known by his courtesy title of VISCOUNT CASTLEREAGH, statesman, eldest surviving son of Robert Stewart, the first Marquis, was born on June 18th, 1769. He was educated at a public school in Armagh and after a year spent at St. John's College, Cambridge, made a tour in Europe, specially studying home and foreign politics. On coming of age he was summoned back to win County Down from the influence of the Marquis of Downshire. The contest was successful, but it cost £60,000 and permanently impoverished his father. He entered the Irish Parliament as a Whig, pledged to the extension of the franchise to Catholic freeholders. The revolution in France affected his opinions, leading him to consider the parliamentary union of Ireland with England a necessity. He was won over to the Tories by his step-mother's brother, Lord Camden, who in March, 1795, went to Ireland as Lord-Lieutenant. Stewart became Chief Secretary in 1797, and it was his duty to deal with the crisis brought about by the rebellion of '98. Camden resigned and was succeeded by Lord Cornwallis. Although the insurgents, assisted by French troops under General Humbert, were successful at Castlebar the rebellion was soon at an end. Stewart's next task was to carry an Act of Union by Protestant votes with Catholic emancipation in view. He came to London and warned the Ministry that the aggressive policy of the French

Republic forbade a session's delay and was authorised to introduce a measure in accordance with his views. It passed the British Parliament, but not until after considerable delay and resort to corruption, compensation, promises of pensions and promotion in the peerage, did it pass the Irish House of Commons, on June 7th, 1800, by a majority of 65 and the House of Lords by 69. "It passed by purchase" and it is computed that only seven persons voted in the majority without "consideration." But corruption it has been said, "was the only method known of carrying on Irish government." And in this Parliament, elected in 1797 without reference to the question of ending its existence, lots were drawn among the members as to which of them should be sent to London. Castlereagh returned to London and endeavoured to redeem his and Pitt's pledges to the Catholics. "I count any man my personal enemy who proposes any such measure," said George III., who felt bound by his Coronation Oath to maintain the tests which excluded Catholics from political office. Pitt consequently resigned, followed by Castlereagh who, however, accepted office in the Addington administration, becoming, under pressure from Pitt, president of the (East India) Board of Control. On Pitt's return to power in December, 1804, Castlereagh retained this post and in 1805 became also Secretary for War and for the Colonies, which offices he filled until the Government resigned on the death of the great minister in January, 1806. In the Portland administration he was again Secretary for War, from April, 1807, to September, 1809, when he became associated with his countryman Canning, each of whom despised the other and each aspired to be leader. The unfortunate Walcheren expedition brought their rivalry to a head. Learning that his dismissal had been decided upon Castlereagh challenged Canning. They met on Putney Heath and their duel, though it resulted in little personal damage, led to their resignation. In 1812 Castlereagh became Foreign Secretary and held this post until his death. On Spencer Perceval's assassination he was given the leadership of the House of Commons notwithstanding Canning's claims. He realised that the power of Napoleon must be broken and soon became not only the guiding spirit of the policy of the British cabinet, but leader of the foreign coalition against the Emperor. When the Allies entered France he attended the Congress of Châtillon, on February 3rd, 1814, and after the preliminaries of peace were signed in Paris, April 11th, returned to England, where he was received with enthusiasm and rewarded with the order of the Garter. He attended the Congress of Vienna in September, seeking to ensure a permanent peace by the restoration of the Bourbons. The escape of Napoleon from Elba reunited the European Allies, and after Waterloo and his surrender Castlereagh signed the second peace of Paris. His was the choice of St. Helena as the place of Napoleon's safekeeping. With Wellington and Canning he again represented the United Kingdom at the Congress of Aix-la-Chapelle, 1818, at which he recommended the withdrawal of the allied forces from France. He was pre-

paring to take part in a congress at Verona when, overwrought by his many duties, his mind became affected. Wellington urged his physician to take precautions. His razors were removed from him, but in a fit of insanity he cut his throat with a pen-knife and died at his country seat, North Cray Place, Kent, on August 12th, 1822. He married Lady Emily, daughter and co-heiress of the 2nd Earl of Buckinghamshire, on June 9th, 1794; he succeeded to the marquise in 1821 and, being childless, was in turn succeeded by his half-brother, Charles William, Lord Stewart (1778-1854). Cold in manner, courteous, resolute and indifferent to popularity, the passions he aroused found scandalous expression when he was buried, next to Pitt, in Westminster Abbey. His services to the peace of Europe have been but tardily recognised.

Steyn, MARTINUS THEUNIS, last President of the Orange Free State, was born at Winburg, in the Orange Free State (as it then was), South Africa, on October 2nd, 1857. He was educated at Grey College, Bloemfontein, and Wevante, Holland. He studied Law and became a member of the Inner Temple. Practising as an advocate in Bloemfontein, he was State Attorney in 1889, Second Puisne Judge from 1889 to 1893, and First from 1893 to 1896, in which year he was elected to the Presidency of the Orange Free State. He invited Sir Alfred (afterwards Lord) Milner and President Kruger to the Bloemfontein Conference in 1899, and from that time was closely connected with the negotiations which terminated in the war with the two republics. He took the field in person, and after the annexation of the Transvaal and Orange Free State, offered a stubborn resistance to the British troops. In company with De Wet he maintained an active warfare up to the conclusion of peace in May, 1902, when he saw his native state annexed to the British Empire under the style of the Orange River Colony. His health was completely shattered, and at the end of the war he came to Europe.

Stickleback, a fish belonging to the spiny-finned genus *Gasterosteus*, with some ten species, from the North Temperate and Arctic zones. They are of small size and have the first dorsal fin replaced by spines, and bony plates along the sides. All are nest-builders, and in



THE THREE-SPINED STICKLEBACK
(*G. aculeatus*).

in the breeding season the males are brilliantly coloured. The Three-spined Stickleback (*G. aculeatus*) is common in British waters.

Stigand, Archbishop of Canterbury, first appears as the chaplain and minister of Queen Emma, widow of Ethelred and afterwards of Canute. In April, 1043, he was consecrated Bishop of Elmham, or of the East Angles, but was deposed by Edward the Confessor, who also deprived him of other of her possessions. In the following year he was restored to favour, re-instated in his office, and, in 1047, translated to the see of Winchester. After the deposition by the Witenagemot of Archbishop Robert, who retired to his monastery at Middelburgh, Stigand was installed as his successor, in 1052, and in 1065 he assisted at the consecration of Westminster Abbey. On the death of Edward he summoned the Witenagemot, Harold the Saxon as elected, and it was hoped the Norman influence was for ever ended. By him Harold was crowned and after Harold's death he anointed young Edgar Atheling, nephew of Edmund Ironside, but the Conqueror was irresistible, and Stigand, with the leading thanes and citizens, overpowered by force, submitted at Wallingford. Though treated respectfully by William the Conqueror, Stigand was not permitted to officiate at a coronation; he took part in it, but the celebration was the northern primate, Ealdred who, some authorities assert, had anointed Harold also within the year. Unwillingly Stigand accompanied the King to Normandy in 1067, and was honourably received. On their return he had Edgar conveyed to Scotland, where he was welcomed by King Malcolm, who afterwards became his brother-in-law. In their absence the indignation of the people had been aroused by the conduct of the emperor's followers. Stigand and the Saxon Earls found it prudent to retire with what treasure they could to the Camp of Refuge standing above the marshes in the Isle of Ely. They were pursued by the Normans and among the prisoners Stigand was taken, loaded with chains, and he spent the remainder of his life in custody at Winchester, his prison at Canterbury being filled by Lanfranc, prior of Bec in Normandy. He was charged with retaining the see of Winchester with that of Canterbury; with using the pall of Archbishop Robert and of receiving a pall from the anti-Pope Benedict X. His defence was in vain. Home considered the charges were pretences on the part of his accusers. When he died, on February 22nd, 1072, the key which preserved his secret hoard was found on his neck and the treasure which he concealed as the means of expelling the hated Normans came into their possession. The last Anglo-Saxon Archbishop of Canterbury was honourably buried in the cathedral abbey of St. Swithun, Winchester.

Stilbene ($C_{14}H_{12}$) is prepared by the action of sodium on benzoic aldehyde. It is insoluble in water, soluble in boiling alcohol, melts at 115° and boils at 306° .

Stilicho, FLAVIUS, Roman general, was probably a Vandal, born about A.D. 359, and in

early life saw service in the Roman army. His successful negotiation of a treaty with the King of Persia in 384 led to his receiving the favourite niece of the Emperor Theodosius in marriage. He was appointed guardian of the sons of Theodosius on the latter's death, and received high commands and other honours. He was thwarted in his ambition by Rufinus, whom he caused to be murdered, but he gained great victories over Alaric and his Goths. Honorius, the son of Theodosius, finally suspected him of treachery and ordered his assassination in 408.

Still is the apparatus used for distilling any liquid. It consists of a boiler (often of copper) in which is placed the liquid whose vapour is required. From the neck of the boiler leads a long tube, called the worm; this is generally coiled into a compact form, and kept in a vessel known as the refrigerator, through which cold water is constantly flowing. The vapour, rising into the neck of the boiler, becomes condensed in the cooled worm and flows from a tube at the bottom of the worm into the receiver. Stills used for distilling different liquids vary in details, but the principle of all is the same.

Stillingfleet, EDWARD, Bishop of Worcester, was born at Cranborne, Dorsetshire, England, on April 17th, 1635, and was educated at Cranborne Grammar School, Ringwood and St. John's College, Cambridge. After he was ordained he received a living at Sutton, and while there published his *Irenicum* (1659), a work which he subsequently retracted to some extent. At the Restoration he was given several valuable preferments, and on the accession of William III. was appointed to the see of Worcester (1689). He died at Westminster on March 27th, 1699. He was engaged during most of his life in strong controversy with Catholics and Dissenters, and wrote many works against them. His two chief works are his *Origines Sacre*, or a *Rational Account of the Christian Faith* (1662) and his *Origines Britannica* (1685), the latter an excellent example of his capacity as an antiquary.

Stilt, a bird belonging to the genus *Himantopus* of the Snipe family. These birds owe their names to their long legs. *H. candidus*, about thirteen inches long, with black and white plumage, is a summer visitor to the British Isles.

Stimulants, drugs which excite the activity of various organs of the body, mainly by the effect they produce on the central nervous system or on local nerve centres. Alcohol, carbonate of ammonia, ether, camphor, etc., are familiar examples of stimulant drugs. According to the particular part of the body they are designed to affect, stimulants are sometimes classified as cerebral, cardiac, circulatory, gastric, hepatic, and respiratory stimulants, and the like.

Sting Ray, a fish belonging to the family Trygonidae, in which the tail bears a long barbed spine, representing the dorsal fin, and capable of inflicting a severe wound, difficult to heal, owing to the mucous secretion from the skin. When the

dart is worn out it is detached and a new one grows in its place. In a fish three feet in length the spine may be seven inches long. The Sting Ray lives on shallow, sandy ground, seldom takes bait and when captured is usually caught by accident. Its flesh has a rank flavour. There are several species, mostly in tropical and sub-tropical seas, but one, the Fire-flare (*T. pastinaca*), is British.

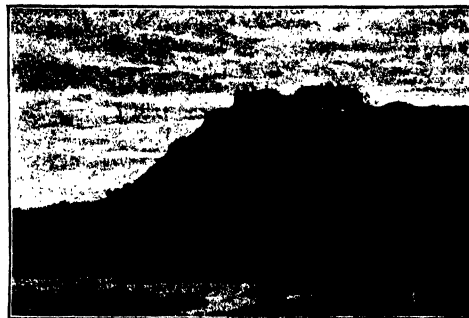
Stinkstone, a name applied to those limestones which, from the presence of either bituminous matter or sulphuretted hydrogen, have a fetid odour, especially when freshly broken. The Carboniferous Limestone of some parts of Ireland even imparts this odour to well and spring water. Workmen have been so overpowered by it that they have been obliged to give up work for a while.

Stinkwood, a valuable South African timber, the product of *Ocotea bullata*, a member of the order Lauraceæ, which grows fifty or sixty feet high, and four or five feet in diameter. The wood is said to be almost equal to teak for durability and strength, but has become scarce from former reckless destruction of forests. It varies in colour from white almost to black. Its name has reference to the fetid odour of the wood.

Stipule, a basal appendage sometimes present in leaves. They are almost invariably in pairs and are most frequent among Dicotyledons. When they are present the leaf is stipulate; when absent it is exstipulate. The stipules are commonly leafy, and are exceptionally large in cases where the blade of the leaf is reduced, as in many tendrill-bearing Leguminosæ. They are rarely associated with a leaf-sheath; but are so in the rose. They often serve as bud-scales, as in the alder, oak, beech, and linden, and they are then generally membranous and deciduous. In most acacias they are represented by spines, and in Smilax by tendrils. Various cases of union occur among leafy stipules. They may cohere by their outer margins, as in *Astragalus*, and are then termed opposite, as they form a leaf-like structure opposite their leaf; or they may cohere by their inner margins, as in *Melanthus*, when they are termed axillary; or by both margins, as in the Polygonaceæ, when they are called ocreate, forming a tubular sheath round the internode. When the leaves are two or more in a whorl, stipules may cohere, forming interpetiolar stipules, as in *Galium Cruciatum* and in the epicalyx of the Strawberry. Compound leaves sometimes have stipules below each leaflet, which are termed stipels.

Stirling, the county town of Stirlingshire, Scotland, on the right bank of the Forth, 22 miles N.E. of Glasgow, and 30 miles N.W. of Edinburgh, so that if lines were drawn from place to place Stirling would roughly occupy the apex of the triangle. Its situation is one of the most delectable in the kingdom, the castle (which in many respects recalls that of Edinburgh) commanding a magnificent view of the Gate of the Highlands from Uam Var to Ben Lomond, whilst the scenery of the foreground is extremely picturesque and diversi-

fied, including a *quasi*-maplike delineation of the Links of the Forth. It became a royal burgh in 1119 and holds charters from Alexander I., Alexander II. and Charles I. The old streets climbing the castle hill are narrow (excepting Broad Street, the breadth of which by contrast gained it its name) and irregular and yet contain numerous quaint old-fashioned houses with crow-stepped gables. The principal points of interest in the castle are the Parliament Hall erected by James III. (now a barrack-room), the Palace begun by James V. and finished by Mary and ornamented by



STIRLING CASTLE.

(Photo : Andrew Young, Burntisland.)

curious sculptured figures, and the Douglas Room in which James II. treacherously murdered William, 8th Earl of Douglas, in 1452. On an adjoining rock to the south-east, of somewhat lower altitude than the castle, is the cemetery which for situation is the most beautiful in the United Kingdom and contains under a glass shade fanciful statues of the two meek Margarets who were drowned in the Solway for their fidelity to the Covenant. Below the castle on the north-east is the road of Ballangeich, which supplied James V. with his title ("The Gudeman of Ballangeich") when he went a-roving *sub rosa*. Near this is the Heading Hill where Murdoch, Duke of Albany, and others were beheaded in 1425. On the Castle Esplanade stands a colossal statue of Robert Bruce. Alexander I. died in the castle (1124), James II. was born in it (1430), James V. fled to it from Falkland Palace in 1528, the infant Mary was crowned in it in 1543, and her baby was baptized in it in 1566 according to Catholic rites. There are many other buildings in Stirling of interest either on account of their historical associations, or because of their design. Amongst these are the East and West Churches (together known as Greyfriars Church till 1656, when the division was made) in which James VI. was crowned on July 29th, 1567, when John Knox preached the sermon; the old town house in Broad Street, with a clock tower and chimes; the Municipal Buildings in King Street, the entrance to which is surmounted by a statue of Sir William Wallace; Cowane's Hospital for decayed brethren of the guild of which John Cowane, the founder, was Dean in 1633; Argyll's

Lodging, a beautiful old edifice, erected by Sir William Alexander, the poet, who was created Earl of Stirling by Charles I., which afterwards passed into the hands of the Argyll Campbells, was the headquarters of John, Duke of Argyll, during the Jacobite rising of 1715, and is now a military hospital; Mar's Work, the relic of the palace built by the Earl of Mar about 1570; the Infirmary, High School, Corn Exchange, County Buildings, and the Smith Institute, founded by Thomas Stewart Smith and containing many paintings by himself, a picture gallery and museum. The King's Park is a noble recreation ground where golf and other pastimes are pursued; it was originally occupied by the King's Gardens and still possesses the singular octagonal mound called the King's Knot. The fine four-arched old stone bridge is now disused; it rose to a central point and the towers in which the gate worked are still extant. The new stone bridge was built a little farther down the stream in 1829-31 and farther up stood the wooden structure where, at the battle of Stirling Bridge (September 10th, 1297), Wallace defeated the English. The manufactures include shawls, tartans, tweeds, winecys, carpets, agricultural implements, carriages, leather, and iron bedsteads, besides breweries and iron foundries. The newer town spreads in streets of handsome villas and gardens south of the Back Walk towards St. Ninians, an ancient village now incorporated within the municipal bounds, near which is the historic field of Bannockburn. About two miles to the north-east on the left shore of the river stands the beautiful Early English or First Pointed tower of Cambuskenneth, all that remains of the abbey founded in 1147 by David I. Here were buried James III. and his queen, to whose memory Queen Victoria in 1865 caused an altar-tomb to be erected. The Wallace Monument, a noble structure in the Abbey Craig, about two miles to the north-north-east, is under the perpetual custody of the Corporation of Stirling. Pop. (1901), 18,403.

Stirling, JAMES HUTCHISON, metaphysician, was born at Glasgow on June 22nd, 1820, and studied in the university of his native town. Till 1851 he practised medicine. He is the most eminent of the older Scottish Hegelians, his *Secret of Hegel* (1865) being a masterly exposition of the system. Among his other works are a criticism of *Sir William Hamilton* (1865), an attack on Darwin and Huxley, entitled *As Regards Protoplasm* (1869), a *Text-book to Kant* (1881), *Philosophy and Theology* (1890), being the first Gifford lectures at Edinburgh University, and *The Categories* (1903). His translation of Schwegler's *History of Philosophy* is a useful handbook (1867).

Stirling, WILLIAM ALEXANDER, EARL OF.
[ALEXANDER, WILLIAM.]

Stirling-Maxwell, SIR WILLIAM, connoisseur, only son of Archibald Stirling of Keir, was born at Kennure, near Glasgow, on March 8th, 1818. Educated at a private school at Olney, he entered Trinity College, Cambridge, in 1835, where Whewell was his tutor, and graduated B.A. in 1839 and M.A.

in 1843. During his early travels in Syria, Italy and Spain his interest was especially aroused in Spanish Art. His father's death in 1847 made him master of an ample fortune and he determined to pursue the study of the literature, art and history of Spain, then but little known in England. In 1848 his *Annals of the Artists of Spain*, compiled from original sources, appeared and it attracted much attention. *The Cloister Life of the Emperor Charles V.* followed in 1852 and was warmly praised by Milman, Prescott and Motley. *Velasquez and his Works*, an important study of that great painter, was published in 1855. He was returned unopposed in 1852 as Conservative member for Perthshire, which he continued to represent for many years. On the death of his uncle Sir John Maxwell, in 1865, he succeeded to the baronetcy and assumed the name of Maxwell. In the same year he married Anna, daughter of the 10th Earl of Leven, by whom he left two sons. After her death, in 1874, he married, on March 1st, 1877, the Hon. Caroline Norton, poet and novelist, granddaughter of R. B. Sheridan. They were old friends; she was an invalid confined to her house (where the ceremony took place) and to his distress she died on June 15th following. Stirling-Maxwell himself died at Venice, of fever, on January 15th, 1878. Five years later his most elaborate work, *Don John of Austria, or Passages from the History of the Sixteenth Century*, was published. It had been printed for private circulation in 1859, but his fastidious care had delayed its public issue earlier. Besides many other minor works, privately printed in sumptuous style, he wrote smaller pieces in prose and verse. The friend of the chief men of letters of his day, he was a trustee of the British Museum and the National Portrait Gallery; was elected Lord Rector of St. Andrews in 1862; Rector of Edinburgh University in 1872; and installed Chancellor of Glasgow University on April 27th, 1876.

Stirlingshire, a midland county of Scotland, bounded on the N. by Perthshire (the Forth being largely a natural boundary), on the N.E. by Clackmannanshire and the Forth, on the S.E. by Linlithgowshire, on the S. by Lanarkshire and a detached portion of Dumbartonshire, and on the S.W. and W. by Dumbartonshire. It occupies an area of 451 square miles. In the north is the level plain of the Carse of Stirling, extending eastwards from Buchlyvie for a distance of 28 miles with a breadth varying from one mile to four miles, much of which consists of very fertile land, partly reclaimed from peat. From the centre towards the south-west run the Lennox Hills, in four sections named after the principal parishes which they traverse—the Gargunnoch Hills (1,591 feet), Fintry Hills (1,676), Kilsyth (1,393) and Campsie (1,894). The country to the east of Loch Lomond is mostly mountainous, Ben Lomond (3,192 feet) being the most notable feature. The Forth is the chief river and among other streams are the Endrick, flowing to Loch Lomond, the Grange, Carron and Bannock falling into the Forth. The eastern half of Loch Lomond—justly called the Queen of Scottish lakes—belongs to the county, and Loch Arklet and a few

small lochs form the chief freshwater sheets. The minerals include coal (plentiful in the south-east), ironstone, freclay, limestone and oil-shale. Oats, wheat, barley, potatoes and turnips are the leading crops and sheep, cattle, horses and pigs are reared. The Carron Ironworks, founded in 1760, and the Falkirk Ironworks, established in 1819, are important centres of the iron industry. Other manufactures comprise woollens and textiles, chemicals, calico-printing, brewing, distilling and shipbuilding. There are popular mineral waters at Bridge of Allan. Stirling is the county town and Grangemouth the chief seaport. A small portion of the Wall of Antoninus occurs in the shire and Roman remains have been found at Castlecary and Camelon. Sir William Wallace lived at times with his uncle, the parson of Dunipace, and sought the shelter of the oaks of Torwood. Several great battles were fought in the shire, especially Stirling Bridge (1297), Falkirk (1298, where Wallace was defeated), Bannockburn (1314), Sauchieburn (June 11th, 1488, when James III. was defeated by his insurgent nobles, being stabbed to death at Milton whilst trying to escape), Kilsyth (where Montrose defeated the Covenanters on August 15th, 1645) and Falkirk (January 17th, 1746, when Prince Charlie defeated the Hanoverians). Pop. (1901), 142,291.

Stitch, a sharp pain in the side, usually due to muscular affection, but sometimes caused by more deep-seated trouble, particularly by involvement of the pleural surfaces by inflammatory mischief. The former condition is sometimes known as pleurodynia and should be treated (when severe) by rest, the support of a firm bandage or strapping of plaster, nutritious food, cod-liver oil and iron. When the pain is one of the features of pleurisy, it will be treated in connection with that very serious complaint.

Stitchwort, or **STARWORT**, the name applied, owing to their thread-like stalks, to several members of the genus *Stellaria*, which belongs to the Caryophyllaceæ. Their white petals are cleft; they have ten stamens, three styles, and a capsule opening in six valves. The Greater Stitchwort, Satinflower, Adder's-meet, Cuckoo-flower, or Gowk's-meet (*S. Holostea*), with grass-like leaves and large flowers, is one of the ornaments of hedgerows in the season of spring.

Stoat. [ERMEINE.]

Stock (*Matthiola*), a genus of Cruciferae with a nearly cylindrical silique and numerous thin flat seeds in one row. There are about 30 species, 13 of which are European and two British. *M. incana*, wild on the shores of the Isle of Wight, is the origin of the "Queen" stocks in British gardens. *M. sinuata* occurs on the west coast of England. *M. annua* is the Ten-week stock; *M. græca*, the smooth-leaved annual stock; and *M. tristis*, with small brown flowers, the night-scented stock.

Stock Exchange, THE LONDON, "is a voluntary association of those who deal in the various securities which pass by the common name of stocks and shares. It has not enjoyed a single

legal privilege, yet it has thriven, and the public have neglected more than one effort to establish an open market to resort to it for business and to give it exclusive confidence." It is actually a Proprietary Company, dating from about 1800, previous to which year business was conducted in the Rotunda of the Bank of England and in a coffee-house in Threadneedle Street, to which the public were admitted. In 1801, however, a site in Capel Court was acquired and a building erected, which was opened in 1802 with some 500 subscribers. A code of regulations was printed in 1812, and, with numerous additions and modifications to suit altered conditions, exists at the present day. The administration of the Stock Exchange, or "The House," as it is familiarly called, is vested in (1) the Managers, representing the shareholders in the company as a joint-stock undertaking, and (2) the Committee for General Purposes, representing the general body of subscribers. This committee consists of 30 members, including a chairman and deputy-chairman; it controls the business of the House, modifies the code of rules and regulations, or frames new ones as may be necessary, and adjusts disputes between members, or even between members and non-members when the latter desire it. One imperative rule forbids members to advertise or tout for business—a rule of which the investing public are often culpably heedless. Every year in March the committee proceeds to elect or re-elect all members for the year next ensuing, after which it is itself reconstituted. Few changes, however, actually occur, save such as are due to death or withdrawal from business. The subscribers now number several thousands and these alone (and such of their clerks as are "admitted") have the right of entry. They are divided into two classes: (1) Dealers or Jobbers, who act as middlemen, and devote their attention severally to particular classes of securities in which they deal, thus forming various groups or "markets" in the House; and (2) Brokers, who act as intermediaries between the public and the jobbers. This distinction does not hold good for the provincial markets, in which only brokers are found. The general business of the Stock Exchange consists in the buying and selling of securities, including British, Colonial, and Foreign Government stocks, and the stocks and shares of railways, banks, and industrial concerns, embracing all joint-stock companies. Transactions are, in the great majority of cases, made for settlement on the "account-day" next succeeding, two of such days being appointed by the committee every month, one about the middle and the other at the end. Transactions in British, Indian and Colonial Government stocks, however, are made either for "cash" or for the "consol" settlement, which takes place once a month. An "official list" is published daily, showing the nominal quotation of all the principal securities dealt in, and the prices at which "bargains" have actually been done on that day. It will be seen that the London Stock Exchange thus supplies a real need of the present day, offering to the public a ready means of buying or selling securities at current market prices. There

are provincial exchanges in the leading towns of the United Kingdom. On the Continent the principal exchanges are those of Paris (the Bourse) and Berlin, while in the United States the institution in Wall Street, New York, is the mart-in-chief. The foreign exchanges have their own procedure and are governed by their own rules.

Stockholm, the capital of Sweden, situated on several islands on the east coast, mostly connected by bridges, at the point where the waters of Lake Mälär discharge into the Baltic. The beauty of its position and similarity of construction have invested it with the title of the Venice of the North. It was founded about 1250 by Birger Jarl, but did not become the capital until a comparatively recent date, the old kings preferring a movable to a fixed seat of government. Staden, the old city, occupies an islet in the main channel, and affords space for the fine royal palace, filled with treasures of art; the church of St. Nicholas, in front of which stands the statue of Olaus Petri, the reformer (1898); the Exchange; and the Riddarhus. To the west lies Riddarholm with the old Franciscan church and the Office of the Archives; on Helgeandsholm, an islet immediately to the north, stand the Houses of Parliament and the Bank of Sweden. Norrmalm, the modern quarter, communicating with Staden by the Norrbrö, or North Bridge, contains the chief railway station, the opera house, the Academy of Fine Arts, several scientific and educational institutions, the Royal Garden and other parks. Blasieholm seats the National Museum and Academy of Music; Kungsholm the High School of Medicine and several hospitals; Ladugårdsland the Hop Garden with statues of Linnæus (1885) and Scheele (1892); Djurgården (the Deer Park), the favourite playground of the inhabitants, the Zoological Museum and the Northern Museum; and Södermalm, the southern suburb, the church of St. Catherine, the Catholic church of St. Eric and two parks. The industries comprise, amongst others, iron-founding, engineering, brewing, distilling, the making of articles of food, sugar, soap and tobacco, shipbuilding and cotton-spinning. Pop. (1901), 317,964.

Stockmar, BARON CHRISTIAN FRIEDRICH VON, friend of the Prince Consort, was born at Coburg, Germany, on August 22nd, 1787. His father, Johann Stockmar (1760-1825), a lawyer, of Swedish descent, had him educated at the Coburg Gymnasium and he studied medicine at Würzburg, Erlangen and Jena. In 1810 he began to practise under his uncle, Dr. Sommer, in Coburg where, in 1812, he organised a great military hospital in which he appears to have introduced an innovation, now general—the keeping of doors and windows open at all times. When Prince Leopold of Saxe-Coburg married the Princess Charlotte in 1816, Stockmar was invited to come to England as his private physician and on the death of that unfortunate lady he promised never to leave the unhappy husband as long as he could be of use to him. Another physician was engaged and Stockmar became the Prince's secretary and comptroller of his household, in which capacity he remained until 1831. In August,

1821, he married his cousin, Fanny Sommer, making a home in Coburg where, for thirty-six years, he was only able to spend an average of six months yearly. In the same year he received a patent of Saxon nobility; in 1831 he was raised to the rank of a Baron in Bavaria and, in 1840, he became an Austrian Baron. He was Leopold's adviser when the crowns of Greece and of Belgium were offered to him and quitted his service in 1834, not wishing for any official appointment in the new kingdom. He was unambitious and returned to his home, but continued to be consulted in confidential matters until in 1836 another duty was assigned to him. Leopold I., careful of the interests of his niece, the Princess Victoria of England, charged him to become her adviser and in the difficulties which surrounded the young Princess he filled his delicate post discreetly. At her wish he accompanied, in 1838, Prince Albert, whom he considered "a fine young fellow," on a tour in Italy and the Prince found his society "most precious and valuable." After their marriage, naturally the man whom each trusted was constrained to continue his attendance upon them and this notwithstanding a frankness occasionally unsparing. For seventeen years he was their familiar counsellor, guiding their lives and regulating the education of their children. His knowledge of men and his discretion invariably saved him from giving offence. His ideals were, to see Germany united, and the establishment of a unity of purpose between Germany and the United Kingdom. He was zealous in promoting the marriage of the Princess Royal of England, whom he thought exceptionally gifted, with Prince Frederick William of Prussia. When he felt no longer equal to the "exhausting work of paternal friend," he retired to his home, where he died of apoplexy on July 9th, 1863, having in the previous year met the widowed Queen in Coburg and wept with her over his "dear, good Prince." In Max Müller's opinion he always preserved his independence and valued his honour above the highest distinctions and Lord Palmerston, no friendly critic, said, "I have come in my life across only one absolutely disinterested man—Stockmar."

Stockport, a town on the borders of Cheshire and Lancashire, England, occupying a commanding site on the Mersey, 6 miles S.E. of Manchester. A Norman castle existed here, and the place grew to some size before the Civil War, but its present prosperity is entirely due to the cotton-mills and felt factories established towards the close of the 18th and the beginning of the 19th century. It has also iron-foundries, machine-works, breweries and flour-mills. The principal buildings are the church of St. Mary the Virgin (rebuilt in 1817, with the exception of the beautiful chancel); the Grammar School, founded in 1387, but with modern buildings, the town hall; the Technical and Art School; the Sunday School, founded in 1784 and the largest in England; the Mechanics' Institute; the infirmary and the free library. To Richard Cobden, who represented the town in the House of Commons from 1841 to 1847, a statue was erected in St. Peter's Square in 1886. Pop. (1901), 78,871.

Stockton, FRANCIS RICHARDS (usually FRANK R.), novelist, was born in Philadelphia, United States, on April 5th, 1834, and educated at the Central High School of his native city. He started life as an engraver, but gave this up for journalism. He speedily acquired a reputation for his fantastic tales for children and then he essayed general fiction. His dry, quaint humour, firm, fresh and sure handling, and clean and wholesome stories, soon gave him a leading position, which he retained until his death, which took place at Washington on April 19th, 1902. His principal works are *Rudder Grange* (1879), *The Lady or the Tiger?* (1884), *The Late Mrs. Null* (1886), *The Casting Away of Mrs. Lecks and Mrs. Aleshine* (1886), *The Hundredth Man* (1887), *The Dusanter* (1888), *Personally Conducted* (1889), *The Great War Syndicate* (1889), *Rudder Grangers Abroad* (1891), *Pomona's Travels* (1894), *Adventures of Captain Horn* (1895), *Mrs. Cliff's Yacht* (1896), *The Vizier of the Two-horned Alexander* (1899), and *A Bicycle of Cathay* (1901). His books for children include *Ting-a-ling Stories* (1870), *Roundabout Rambles* (1872), *What Might have been Expected* (1874), *Tales Out of School* (1875), *A Jolly Fellowship* (1880), *The Floating Prince* (1881), and *The Story of Viteau* (1884).

Stockton-on-Tees, a town of Durham, England, on the left bank of the Tees, 10 miles N.E. of Darlington. Though dating from Roman times, and containing until 1865 the scanty ruins of a mediæval castle, the town only began to attain prosperity towards the middle of the 19th century through the growth of the iron and steel trade. The port does a large trade in shipping coal to the South and to the Baltic, and, in addition to blast-furnaces, iron-foundries, and steel-works, there are large building-sheds, sail-cloth factories, potteries, and breweries. The prominent buildings include the church of St. Thomas, the Catholic church designed by A. W. Pugin, the town hall, the borough hall, exchange hall, free library, literary institute, and the hospital. Joseph Ritson (1752-1803), the crumbed antiquary, was a native. Pop. (1901), 71,812.

Stoics, a sect of philosophers of ancient Greece, founded about 308 B.C. by Zeno of Elea, who taught in the *Stoa Poikilè* or "Painted Colonnade" of the Agora at Athens. They inculcated the pursuit of active virtue as the supreme good, with complete repression of all passions and emotions. They explained the universe by a materialistic pantheism, heat or fire being the actuating and divine principle. Though nominally maintaining human freedom, they made it consist only in conscious submission to the universal reign of law in nature. Their doctrines exercised greatest sway amongst the Romans of the best period in the history of Rome. They were amongst the earliest to attempt to reconcile science and religion, but the one they knew as materialistic psychology and the other as theological pantheism. The austerity of their morality and the fidelity with which they observed their ethics became proverbial and in general usage the word "stoic" grew to signify a person who bore pleasure and pain, prosperity and adversity alike

unflinchingly, sustained by a fortitude that was neither self-conscious nor theatrical.

Stoke-on-Trent, a town of Staffordshire, England, on the Trent, 15 miles N. of Stafford. The principal buildings include the town hall, market hall, the School of Art erected to the memory of Herbert Minton (1793-1858), and the infirmary. There are statues of Josiah Wedgwood (1863) and Colin Minton Campbell (1886). Stoke is the centre of the Potteries district and noted for its porcelain and earthenware goods, but the iron industry and coal-mining are also important. Pop. (1901), 30,456.

Stoke Poges, a village and parish of Buckinghamshire, England, 2 miles N. of Slough. The beautiful "God's acre" of the fine old church was the scene of Thomas Gray's immortal "Elegy in a Country Churchyard," composed in 1750. The poet was buried in the churchyard twenty-one years later. Sir Edwin Landseer painted several pictures at the mansion of Stoke Park, when it was occupied by Edward James Coleman, from one of which ("The Chase") he drew the figure of the stag for the Running Deer competition amongst the volunteers first at Wimbledon and afterwards at Bisley. Burnham Beeches are in the vicinity. Pop. of parish (1901), 1,398.

Stokes, SIR GEORGE GABRIEL, mathematician, was born at Skreen, County Sligo, Ireland, on August 13th, 1819, and educated at Dublin, Bristol and Pembroke College, Cambridge, where he became Lucasian Professor of Mathematics in 1849. He was secretary of the Royal Society (1854-85) and President (1885-90). He was created a baronet in 1889 and represented his University in Parliament from 1887 to 1892. His investigations in hydrodynamics, the theory of light, and other departments of mathematical physics, gave a great stimulus to scientific inquiry. He died at Cambridge on February 1st, 1903.

Stole, in the Latin, Eastern, and Anglican Churches, a strip of silk or other fabric (originally linen) worn by ecclesiastics. Priests and bishops wear it with the middle at the back of the neck, and the ends pendant in front, save that a celebrant priest in the Latin Church has the ends crossed over the breast and secured under his girdle. The stole is widened and fringed at the ends, and frequently has a cross embroidered on the middle and the ends. Deacons wear the stole over the left shoulder, tied on the right side.

Stomach. [DIGESTION.] *Diseases of the Stomach: Gastritis.* Inflammation of the mucous membrane of the stomach may be due to the ingestion of poisonous or irritant substances or of unwholesome food, or to abuse of alcohol; and may occur in association with diseases of other organs, particularly of the heart and liver. The chief symptoms of ordinary chronic gastric catarrh are pain, with tenderness on pressure, foul and coated tongue, headache, flatulence, nausea, slight rise of temperature, and disturbance of the bowels. Treatment consists mainly in regulation of the diet and in the administration of tonic remedies; it is,

of course, of primary importance to deal with the cause of the malady, if it can be ascertained. (The subject of *Indigestion* is dealt with under that head.) *Ulcer of the Stomach.* A disease which is much more common in women than in men; it is often associated with a condition of *anæmia*. The symptoms of the disease are ordinary dyspeptic troubles and more particularly pain, which comes on a short time after taking food, and which is usually followed by attacks of vomiting, the vomit in most instances at one or other period of the disease containing blood (*hæmatemesis*). In cases of gastric ulcer there is always the risk of perforation, with escape of the contents of the stomach into the peritoneal cavity; should this event occur, sudden pain and collapse, followed by peritonitis, supervene. Regulation of diet is the main item in the treatment of the disease, and when *anæmia* is present the appropriate remedies for that condition are administered. Subnitrate of bismuth is a drug of considerable value in relieving the pain and vomiting. *Cancer of the stomach* usually affects the pyloric end of the viscus, and is commonly of the variety known as *scirrhus*; the chief symptoms are vomiting, digestive troubles, wasting, and the presence of a tumour which can be felt through the abdominal wall. For vomiting of blood, see *HÆMATEMESIS*.

Stomate, a transpiration-pore in the epidermis of the sporophyte in the higher plants. It is an aperture surrounded by two cells termed guard-cells, which retain their protoplasm and chlorophyll and change in form so as to open or close the aperture. The aperture communicates with a large intercellular space within the epidermis. The guard-cells result from the division of a single epidermal cell, and are cuticularised on their outer surfaces. Stomates occur on the "capsule" of mosses, on fern-fronds, and on most sub-aërial parts of flowering plants. They are absent from roots and submerged structures, and are generally few in number on the upper surface of dorsiventral leaves. On the under surface there may be as many as 600 to the square millimetre. Similar but larger and immobile guard-cells flank an aperture known as a water-stomate on some leaves, by which water from a vascular bundle is exuded, as in *Tropæolum*, *Alchemilla*, some aroids, and many saxifragæ. The term "stomate" has been wrongly extended to the large pores of totally different origin on the thallus of the liverworts. The opening and closing of a true stomate is effected by an increased or diminished curvature of the guard-cells, the result, it would seem, of their assimilative processes.

Stomatopoda, an order of Crustacea, including the genus *Squilla* or the Locust Shrimps. The order is characterised by the possession of a short cephalothoracic shield, or plate, protecting the anterior part of the body. The abdomen is large, and the branchiæ or gills occur on the bases of the limbs beneath it. The shell is generally thin and flexible. They are all marine; the earliest form which is certainly referable to this order occurs in the Jurassic.

Stone. [CALCULUS.]

Stone, a weight which is nearly out of date, although it has, with different values, been used in many countries. The legal British stone is 14 lb., but various trades have used values of the stone vastly differing in amount—*e.g.*, 8 lb. for meat, 16 lb. for cheese, etc.

Stone Age, a term employed by ethnologists to designate a period in the progress of mankind towards civilisation. The word "age," however, has no reference to chronology but denotes rather the condition of the human race in a certain stage of its development. The Age was called Stone, because man made his tools and weapons of this material. It thus indicates the rudest or most primitive period; and since some branches of the race showed greater advance than others in adapting stone to everyday purposes, the Age became divided into the Palæolithic, or Old Stone, and the Neolithic, or New Stone, the latter indicating, in the polished and sharpened state of their implements, that some men had already begun to improve upon those of their fellows who were still addicted to the use of the rougher material, which they had not yet acquired intelligence enough to manipulate. The word "age" having in this respect no chronological value its use is unfortunate, because it has come to imply remoteness, even to the prehistoric epoch, whereas there are living tribes still in their stone age.

Stonechat (*Saxicola rubicola*), a fairly common bird of the Thrush family, occurring throughout Central and several parts of Northern Europe. The male is about five inches long; in his summer plumage the upper parts are black and brown, with some white on the wings, and the lower part is ruddy. These birds feed on insects, worms, and seeds.

Stone Circles are unhewn standing stones, or menhirs, disposed in a ring. For a long time these prehistoric monuments were erroneously associated with Druidical worship, and in many instances they still figure in local guide-books as "Druidical remains." It is now certain that, in most cases at any rate, their chief purpose was the enclosure of a piece of ground in which interments took place. This conclusion has been arrived at from the result of excavations, which show that the ground enclosed by many of the stone circles of Scotland was, in prehistoric times, a burial-place. Moreover, from the relics found in tombs that have been uncovered it appears that they belong to the Bronze Age. When the body was cremated, as was usually the case, the ashes were put into a hole in the ground and covered with an inverted funeral urn, though sometimes this protection was not afforded. The bodies that were buried without cremation were deposited in stone cysts. Hence it appears that these stone circles answered precisely the same purpose as the walls of the burial-places of the present day. At any rate, this was their chief purpose. And since the chambered cairn of New Grange, in Ireland, was surrounded by a stone circle, and as the stone circles of Scandinavia have also been demonstrated by excavation to enclose

burial-places, it seems probable that the circle at Avebury, in Wiltshire, is of the same character, though some hold that it was erected to mark the spot on which the last Arthurian battle was fought. The same conclusion may be, in all probability, applied to the smaller, but more famous, circle at Stonehenge. At the same time something is to be said for the view that connects these megalithic monuments with the religion of vanished races, especially when it is remembered that in India at the present day menhirs are objects of veneration. [STANDING STONES.]

Stonecrop, a name applied to most of the species of the genus *Sedum*. This genus of 126 species, of which forty-four are European and eight or nine are British, comprises fleshy plants, mostly small, with cymes of yellow, white, or purple star-like pentamerous flowers, with ten stamens and five carpels forming follicles. They grow on rocks, walls, sand, and other dry situations, the most common, *S. acre*, being a small plant with densely imbricate leaves and golden flowers, sometimes called "wall-pepper."

Stonehaven (locally called Stanehive), seaport and county town of Kincardineshire, Scotland, on the Carron, which divides it into the old and the new towns, 13 miles S.S.W. of Aberdeen. The chief buildings are the market house (1827), the town hall (1878), the county buildings and St. James's Episcopal church (1877), in the Norman and Early Transition from the designs of Sir Rowand Anderson. The industries comprise the sea fisheries, distilling, brewing, and weaving. The town is in growing repute as a midsummer resort. The famous ruins of Dunnottar Castle are situated on the coast, $1\frac{1}{2}$ mile to the south-east. Pop. (1901), 4,577.

Stonehenge (Saxon, *Stan*, stone, and *hangian*, to hang or support), an ancient monument of alleged Druidical or Celtic origin, which stands upon Salisbury Plain, two miles west of Amesbury, Wiltshire, England. It consists of an outer circle, 300 feet in circumference, composed of upright stones 16 to 22 feet high and 18 feet round, upon the tops of which are laid blocks of similar size, so as to form a series of continuous square arches. (One of the trilithons on the north-west of this circle was blown down during a tempest on December 31st, 1900.) Within these, at a distance of nine feet, is a circle of smaller monoliths having no imposts. This ring encloses two ovals, the larger of which consisted of five pairs of trilithons, rising in height from east to west, the smaller comprising nineteen tapering monoliths, whilst in the centre of the whole system lies an altar slab 15 feet long. A ditch enclosed the entire work, which was approached by an avenue in which

stands a cromlech known as the Friar's Heel. Antiquaries variously fix the date of its construction between the 1st century B.C. and the 5th Christian century, and there is reason to believe that the structure had an astronomical significance as well as a religious use.

Stonehouse, or EAST STONEHOUSE, on Stonehouse Pool, Devonshire, England. It is continuous with the town of Plymouth and stands between it and Devonport, thus constituting the central member of the group of the "Three Towns." Pop. (1901), 15,111.

Stone-Whorl. [SPINDLE-WHORL.]

Stone-Worship, a general name for worship paid to unheaven stones, as the dwelling-places or representatives of deities. The best collection of facts about stone-worship will be found in E. B. Tylor's *Primitive Culture*. This crude cult is to be distinguished from the belief in stones as charms and amulets. Charles Godfrey Leland, the creator of "Hans Breitmann," had a profound belief in such things and one of his cherished possessions was the Black Stone of the Voodoos. While staying at Brighton in 1890 he found on the seashore a great many stones with holes in them. These were "Odin stones." Writing about them to his friend Mary Owen he said, "Hang one up at your bed's head and you can never have the nightmare, and they keep off evil influences." Yet Leland was no fool.

Stonyhurst, a noble Elizabethan mansion, picturesquely situated in Ribblesdale, about seven miles north of Blackburn, Lancashire. Founded by Sir Richard Sherburne, it passed, towards the end of the 18th century, to the Weld family, who in 1794 leased the place to Jesuit fathers from Liège for the establishment of a Catholic College, in continuation of that originally planted in 1592 at St. Omer, in the department of the Pas-de-Calais, France, by the Jesuit missionary, Robert Parsons.



[Photo]

STONEHENGE.

[Frith & Co., Reigate.]

Large additions have since been made to the house, and it is now the most important educational institution of its kind in England and is regarded as the Eton of the Catholic community. Its observatory has acquired a high reputation.

Storax is a member of the group of substances known as balsams, and is obtained as a thick brown liquid from incisions in the bark of *Liquidambar orientalis*. It possesses a peculiar sweet odour, and consists chiefly of cinnamic acid together with certain derived compounds and a hydrocarbon C_9H_8 known as styrolene, and is used as a source of this latter compound and of the cinnamic acid. It is used in perfumery and is also employed to a small extent medicinally, as an expectorant, and in the form of an ointment, as a detergent. It was formerly obtained from *Styrax officinale*. In the United States one of the chewing gums is derived by exudation or incision from the bark of the *Liquidambar styraciflua*.

Stork, a bird belonging to the family Ciconiidae, chiefly confined to the eastern hemisphere. These birds are heron-like in form, but of stouter build and with longer bills, and the claw of the middle toe is not serrated. Their favourite resort is in marshy land or near river-banks, and they feed on frogs, snakes, lizards, fish and fish-fry, small mammals, young birds, and insects. The True Storks belong to the type-genus *Ciconia*, of which there are six species widely distributed. The best known is the Common or White Stork (*C. alba*), fairly plentiful in some parts of Europe, especially in Holland and North Germany. Its figures largely in the folk-tales of these countries, and is the heraldic emblem of piety and gratitude. The total length is rather more than 40 inches. The body, head, and neck are white, the wings black, and the legs and bill red. In their northward migration in the spring storks range as far as Scandinavia, and sometimes visit Great Britain. The return journey to Africa is made in autumn. The Black Stork (*C. nigra*), with black plumage above and white below, has strayed to England.

Storms are atmospheric disturbances accompanied by continuous variety in the direction and force of the wind, and generally covering an elliptical or circular area. The overlapping of several storms sometimes occurs, the resultant storm spreading over an area of very irregular shape. The normal tendency to the circular form is, however, of great use in predictions of storms at sea and in weather forecasts. The area visited by a storm may vary from about 1,000 to 5,000 square miles. The direction in which a storm travels is probably controlled by the generally prevailing winds, with modifications introduced by irregularity of the countries over which it passes, and by the occurrence of large expanses of water. In Europe a storm always has some easterly component, although it may vary between N.E. and S.E. On a few occasions when a storm has started in a westerly direction it has ultimately changed and followed an eastern course. In the Mediterranean Sea the storms are changeable in direction and confined to small areas; in the West Indies and in India they often trace out a parabolic path. The want of a sufficient number of meteorological observatories has prevented the deduction and verification of the laws governing the behaviour of storms, and the connection of the storms in different

parts of the world is but very imperfectly understood. On the approach of a storm the barometer falls, clouds form, and the temperature rises, till rain announces the proximity of the storm's nucleus. The rain increases till the storm's centre has passed by, when its violence subsides, the temperature is lowered, and the clouds are dispersed. The rate at which storms proceed varies in different parts of the earth. An average of seventeen miles an hour has been deduced from European storms, twenty-eight for those in North America; while around India the speed is as low as nine miles an hour, and often much less. Certain storms have been known whose velocity was over seventy miles an hour, but such high speed is very rare. It was noted that low pressures precede storms, and it has been found that in the northern hemisphere winds circle round the points of lowest pressure in a direction contrary to the hands of a clock, while in the southern hemisphere their direction is clockwise. As well as this circular direction, however, there is some slight radial inclination towards the centre. The circular direction in which the winds blow has been proved to be connected with the rotation of the earth on its axis, and hence their origin may be compared with that of the trade-winds. The violence of the storm is naturally greater where the wind is strongest, and the violence of the wind depends on the difference of pressures of the places between which the wind is blowing. If there is great difference of pressure between near places, there is great force of wind, and the storm is intensified. Hence the arrangement of lines of equal pressure (or isobars) at any time determines the wind and weather at that time, and since the direction of the wind enormously affects the character of the season, it is at once seen how important a factor is the knowledge of the distribution of barometrical pressure in weather forecasts.

Stornoway, a seaport in that part of the island of Lewis, Outer Hebrides, Scotland, which belongs to the shire of Ross and Cromarty, 55 miles N. of Portree in Skye. It lies at the head of a capacious bay accessible in all stages of the tide. It is the most important fishery centre in the west of Scotland. Stornoway Castle, a noble castellated mansion in the Tudor style, was built for Sir James Matheson (1796-1878) at a cost of £90,000. Pop. (1901), 3,852.

Storthing ("Great Meeting"), the national Parliament of Norway. It is elected every three years and assembles every October, but cannot sit for more than two months without the sanction of the king. It consists of two houses—the Lagthing, composed of one-fourth of the members, and the Odelsting comprising the remainder. New Bills are first considered by the Odelsting, from which they pass to the Lagthing, where they must be accepted or rejected. In the event of difference between the houses, they then meet in common and a two-thirds majority of votes suffices to approve or throw out a measure. The royal veto may be exercised twice, but if the same Bill passes three separate Storthings it will become law *de facto*.

Story, JOSEPH, jurist, was born at Marblehead, Massachusetts, United States, on September 18th, 1779, and was educated at Harvard. Called to the bar in 1801, he was appointed Associate Justice of the Supreme Court of the United States in 1811, and held the post till his death, which took place at Cambridge, Massachusetts, on September 10th, 1845. In 1829 he became law professor at Harvard. He wrote a *Commentary on the Constitution of the United States* (1833) and other important legal treatises.

Stothard, THOMAS, painter, was born in London on August 17th, 1755. He began his career by making designs for a Spitalfields silk-weaver, and then took to the illustrating of the *Norelist's Magazine* and other periodicals. Meanwhile, too, he had entered the Royal Academy schools and exhibited occasionally. It was as an illustrator of books that he first achieved a reputation, his drawings for standard editions of the novels of Fielding, Smollett, Richardson, and Sterne, *The Vicar of Wakefield*, *Robinson Crusoe*, *Gil Blas*, *Don Quixote*, *The Pilgrim's Progress*, and other classics being greatly and justly admired for their grace, invention and spirit. He was especially good in renderings of homely and humorous scenes, incidents of the heroic and historical being, as a rule, beyond his reach. He became an associate of the Royal Academy in 1791, a full member in 1794, and librarian in 1812. He died in London on April 27th, 1834. His best-known pictures were the "Canterbury Pilgrims setting forth from the Tabard Inn" (1807) and "The Flitch of Bacon" (1832). His design for the Wellington Shield (1814) evoked universal praise. He also decorated the cupola in the Advocates' Library, Edinburgh, and the mansions of Samuel Rogers and other notable persons. He was a fine colourist and his industry was appalling. The number of his designs has been estimated at 10,000.

Stoughton, JOHN, Nonconformist historian, was born in Norwich on November 18th, 1807. His father, Thomas Stoughton, whose integrity won him the name of "the honest lawyer," died when he was four years old, and his mother, who had belonged to the Society of Friends, sent him to Norwich Grammar School. On leaving there he went into the office of a lawyer, newly converted to Catholicism, and found religious controversy and Milner's *End of Religious Controversy* more interesting than the study of Blackstone's *Commentaries*. When about seventeen he felt it his duty to devote his life to Christian preaching and pastoral work and he, baptized a Churchman, arrived at the conclusion "that Congregationalism, on the whole, came nearest to New Testament teaching." This led to his entering Highbury College in 1828, where he met Henry Rogers, his most distinguished fellow-student. In 1833 he became co-pastor of the Congregational chapel at Windsor, from which he removed to Kensington, in 1843, having been unanimously invited to become minister of Hornton Street Chapel. Here he remained until 1875 and on his retirement was pre-

sented by his admirers with £3,000. Chairman of the Congregational Union in 1856, he received the honorary degree of D.D. from Edinburgh in 1872, in which year he became Professor of Historical Theology and Homiletics in New College, St. John's Wood. In 1876 he arranged a Conference, suggested and presided over by Archbishop Tait, between Churchmen and Dissenters, which resulted "in no united action; no fresh organisation had ever been intended." The intimate of many distinguished men, his friendship with Dean Stanley led to his being invited to lecture on Missions in Westminster Abbey in 1877 and to his being a pall-bearer at both Lady Augusta Stanley's and the Dean's funerals. After resigning his chair at New College he lived in retirement and died, of old age, at Ealing on October 24th, 1897. By his wife Mary, daughter of George Cooper of Windsor, whom he married in 1835 and who died in 1879, he left three daughters and a son, Thomas Wilberforce Stoughton, member of the well-known publishing firm of Hodder and Stoughton, seven children having predeceased their mother. His frequent foreign travels proved useful in the literary work he undertook. His elaborate *Ecclesiastical History of England*, 1867-1870, was followed in 1878 by *Religion in England under Queen Anne and the Georges*, and a further sequel, *Religion in England from 1800-1880*, in 1884, all of which show careful study. *Homes and Haunts of Luther*, *Footprints of Italian Reformers*, *The Spanish Reformers*, and *Recollections of a Long Life*, are but a few of the books which attest his industry.

Stourbridge, a town of Worcestershire, England, on the left bank of the Stour, about 12 miles W. of Birmingham. The principal buildings include the Grammar School founded in 1552 by Edward VI. and reorganised in 1875, the Bluecoat or Hospital School founded in 1667 and enlarged in 1884, the Town Hall, the School of Science and Art, the Corn Exchange, and a Catholic church from the designs of A. W. Pugin. Hungary Hill commemorates the arrival of the refugees from Hungary and Lorraine in 1555, who established the glass and pottery works from the fire-clay for which the district is noted. There are also iron-works, brewing, malting, and the making of glue, parchment, nails, spades, shovels, scythes, chains and anvils. Pop. (1901), 16,302.

Stow, JOHN, antiquary, was born in London about 1525. He followed his father's trade of tailor, but towards the middle of his life began to collect books, documents, manuscripts and other scarce objects. In 1561 he published an edition of *The Workes of Geoffrey Chaucer*, and five years later appeared his *Summarie of Englyshe Chronicles*. In the religious controversies of the age he was suspected of being disaffected towards the Reformed doctrines, but his cheerful disposition and love of learning enabled him to rise superior to the petty persecution to which he was exposed and he pursued his inquiries into the past with undiminished zeal. In 1580 he brought out his *Chronicles of England from Brute unto this Present Yeare of Christ*, which appeared in later editions under the

more familiar title of *The Annals of England*. His last work, *A Survey of London* (1598), became in a way a classic and has proved to be invaluable. His declining years were spent in the stress of poverty, borne with admirable courage and patience, and "honest John" died in London on April 6th, 1605.

Stowe, HARRIET ELIZABETH BEECHER, novelist, daughter of Lyman Beecher, Congregationalist minister of Litchfield, Connecticut, where she was born on June 14th, 1811. Her mother dying when she was four years old, she seems to have become the special care of an elder sister, Catherine (1800-78), afterwards distinguished for her efforts on behalf of female education. Her father's library was her favourite retreat and her juvenile attempts at composition resulted in an ambitious essay, read at a school exhibition in her twelfth year, on the question "Can the Immortality of the Soul be proved by the Light of Nature?" Harriet was sent in 1824 to a school which her sister had opened at Hartford, in which later she became a teacher. Here they remained until, upon the appointment of their father as president of Lane Theological Seminary, they removed to Cincinnati, where the elder sister started the Western Female Institute with Harriet as her principal assistant. In 1833 she made her first acquaintance with negro slavery during a visit to the adjoining state of Kentucky across the river. Sympathy for the childless widower of a dear friend led to her marriage, in 1836, with Calvin Ellis Stowe, a professor at the Lane Seminary, and she now began writing short stories and articles. Her interest in the evils of slavery was quickened by the riots which occurred in Cincinnati. Slaves were continually escaping from harsh masters and befriended by the intimates of the young authoress, who in this way learned to know the cruel system which she was to be largely instrumental in ending. Famine, poverty, and ill-health made it necessary for Mrs. Stowe to continue writing and in 1843 *The Mayflower*, a collection of tales, was published. In 1850 her husband became Collins Professor of Natural and Revealed Religion at Bowdoin College, Brunswick, Maine, and the following year she engaged to write a story for *The National Era*, an Abolitionist paper published in Washington. On its completion it was issued in volume form on March 20th, 1852, and entitled *Uncle Tom's Cabin, or Life among the Lowly*. Immediately the poor professor's wife in her endeavour to aid the oppressed became famous and within four months she received £2,000 for royalties. The charge of malicious representation she answered by publishing a "Key" to her widely-read book which still further increased its circulation and led to her first visit to Europe. *Dred; a Tale of the Dismal Swamp*, which reinforced the argument of its predecessor, appeared in 1856. *The Minister's Wooing*, which won both Ruskin's and Lowell's admiration, was published in 1859. The Civil War broke out in 1860. "The blood of the poor slave," she said, "that had cried so many years from the ground in vain" was eventually answered by the President's Proclamation of Emancipation and in 1866, when the unnatural conflict

closed, she had the happiness of witnessing the cause of four millions of slaves triumph. Mrs. Stowe wrote several other books. Her regrettable interference in the Byron controversy, although her motive was worthy, her son considered of doubtful expediency "even to her most ardent admirers." Her husband died in August, 1886, and on July 1st, 1896, her own death occurred at Hartford, where she had been living in retirement.

Stowell, LORD. [SCOTT, WILLIAM.]

Stowmarket, a town of Suffolk, England, on the Gipping (the stream which is known below Ipswich as the Orwell), 12 miles N.W. of Ipswich. The church of St. Peter and St. Mary is in the Decorated and Early English. Dr. Young, the tutor of John Milton, was vicar and in the grounds of the vicarage, which is older than Queen Elizabeth's time, stands the mulberry-tree that bears the poet's name. There are manufactures of chemicals, gun-cotton, and agricultural implements. Pop. (1901), 4,162.

Strabismus, or SQUINT, is the condition in which the visual axes of the two eyes are not both directed to the same point when an object is fixed by the patient. The squint may be convergent or divergent. In the former case, the eye whose visual axis is not directed towards the object is deflected towards the nose; in the latter case it is, on the other hand, deflected outwards. The most common form of squint is the convergent squint which is met with in association with hypermetropia. In this form of strabismus there is no paralysis of any muscle, and it is often the case that either eye is indifferently used by the patient for fixing an object, the squint in that case being termed "alternating" or "concomitant." In most instances, however, after a while the patient acquires the habit of always fixing objects with one eye; the squint is then said to be "fixed" in the other eye. The power of seeing objects with this latter becomes increasingly impaired, and, if the squint remains unrelieved, the eye in which the squint is "fixed" ultimately becomes a blind eye. The cause of the association between hypermetropia and convergent strabismus has already been dealt with. [EYE: *Errors of Refraction*.] Divergent squint is often associated with short sight, and unlike convergent squint there is commonly a serious impairment of the power of vision from the outset; indeed, the eye whose visual axis becomes deflected outwards is an eye, as a rule, which the subject of the squint never uses in fixing objects by reason of its defective vision. Paralytic squint may be met with altogether apart from errors of refraction, as a result of brain disease involving the nerve structures which are concerned with the movements of the ocular muscles. In paralytic squint "diplopia" or double vision is usually present, the images of any object to which the patient directs his gaze falling upon parts of the retinae of the two eyes which do not correspond. This diplopia is often very distressing to the patient. It might have been anticipated that double vision would have also been present in the ordinary con-

comitant squint, but this is not the case as a rule, the subjects of this latter form of squint being rarely troubled with diplopia—a fact which is otherwise expressed by saying they are able to “suppress” the visual image transmitted from the squinting eye. The operation for squint consists in dividing the tendon of one of the ocular muscles; thus, in the case of concomitant squint, the tendon of the internal rectus of one or both eyes is divided with a view to placing the muscle at a disadvantage as compared with the opposing muscles and so obviating its exaggerated action. In some instances, in addition to putting back the attachment of the muscle which is too active, it is necessary to advance the attachment of the opposing muscle. The importance of dealing with the common convergent strabismus of children in its early stages cannot be insisted upon too strongly. Indeed, in some instances the use of appropriate glasses from the time of appearance of the squint is effectual in remedying the condition without making it needful to resort to operation at all.

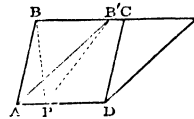
Strabo, a celebrated geographer, was born at Amasia in Pontus, about 63 B.C. His mother belonged to a Greek family. He received his early education at Nysa in Caria, and at Rome, and it was probably in the latter city that he continued his studies under the philosopher Xenarchus. The remainder of his life was devoted entirely to travel. The date of his death is unknown, but he was still writing in A.D. 21. He says of himself: “I have journeyed westwards from Armenia to the parts of Etruria opposite Sardinia; towards the south from the Euxine to the borders of Ethiopia; and perhaps no writer of geographies has visited more places than I have between these limits.” Besides the physical characteristics and natural productions of the countries described, the *Geography* discusses the race, life, manners, and trade of the inhabitants, with some historical digression. It is based both on his own observations and the works of Eratosthenes, Polybius, and other Greek writers. There are seventeen books, the fourth of which is devoted to Gaul, Britain, and Ireland. Strabo also wrote *Historical Memoirs* and a *Continuation of Polybius*, but both are lost.

Stradella, ALESSANDRO, a singer, musical performer and composer of the 17th century, whose works did much to raise the standard of Italian taste. Little is known concerning the details of his life. It is said that he eloped from Venice with Ortensia, the mistress of a nobleman who had befriended him, and that after many perilous escapes the two were murdered at Genoa by assassins sent to track their steps. The fact of his murder has been doubted and it is surmised that he died about 1681. On one occasion, at Rome, his life had been saved through the effect produced by his great oratorio, *San Giovanni Battista*, on the assassins who were waiting for him at the church door. He also composed sonatas, cantatas, etc.

Strafford, THOMAS WENTWORTH, EARL OF, statesman, the son of Sir William Wentworth, of Wentworth Woodhouse in Yorkshire, was born

on April 13th, 1593. After studying at St. John's College, Cambridge, he entered Parliament in 1614, but took no active part in politics till 1621. From that date he endeavoured to maintain the liberties of the people without infringing the authority of the Crown, till the crisis of 1629 drove him to sacrifice his love of freedom to his loyalty. His decision was perhaps hastened by his appointment (1628) to the presidency of the Council of the North with the title of Baron Wentworth. He now proceeded to carry out that policy of “thorough” by which he sought to establish a just and strong Government with the sovereign as coping-stone of the political fabric. The period during which he governed Ireland as Lord Deputy (1633–40) was one of unwonted social and material progress, but his harsh proceedings increased the existing disaffection, and helped to bring about the rising in 1641. In January, 1640, he was created Earl of Strafford and Lord-Lieutenant of Ireland. He was now the king's most trusted counsellor, and was rightly regarded as responsible, above all others, for his arbitrary policy. Immediately after the meeting of the Long Parliament he was impeached of high treason, the form of accusation being subsequently turned into a Bill of attainder. After the Bill had passed both Houses Charles very reluctantly gave it the royal assent, and on May 12th, 1641, Strafford was executed on Tower Hill, in London.

Strain and Stress. Stress is an action between two bodies. If a spring be held in a stretched position by a body, there is a pull of the spring on the body, and an equal and opposite pull of the body on the spring. As long as things remain in that condition this mutual pull produces no effect, and is known as a *stress*; but if one end of the spring be released or the object removed, motion at once ensues. This motion is the result of a



certain force, and the stress is numerically equal to this force, which is also numerically equal to either the action of, or reaction on, the spring. The direction of this force is, of course, in the line of the action and reaction, but it may be in either direction, according to the circumstances which allow it to act. This force is sometimes known by the misleading name of “total stress,” but stress is actually the force divided by the area over which it acts; this quotient (force per unit area) is sometimes also badly named the “intensity of the stress.” If a spring be attached to a point at one end and allowed to hang with, say, a piece of metal at the other, the stress will be simply the weight of that piece of metal divided by the sectional area of the spring, and will be the same if we remove the piece of metal and fix that end of the spring in the same position. The action of such a stress causes the body to be altered in length or in some other way—it produces, in fact, a deformation, and this deformation is properly known as *strain*. In the case of the stretched spring the strain is shown as

increased length, and is measured as the ratio of the increase in the length to the original un-stress changed length. The ratio $\frac{\text{change in length}}{\text{original length}}$, or, in the case of the stretching of a line or a spring, $\frac{\text{change in length}}{\text{force per unit area}}$

elongation per unit length

is known as Thomas Young's modulus of elasticity. A body may be distorted by a shearing stress, and such a distortion is called a shearing strain. Let A D and B C be two parallel layers of a body in its original position, and let the body be distorted so that B C assumes the position B' C', all intermediate parallel layers taking up corresponding sheared positions. If B P be drawn perpendicular to these parallel layers the angles through which it moves is B P B', and the shearing strain is measured by the tangent of this angle, or B B'.

— The shearing strain is of importance in the case of liquids, and is one of the factors entering into the measurement of viscosity.

Straits Settlements, THE, a British Crown Colony, consisting of certain parts of the Malay Peninsula on the Strait of Malacca. It comprises Singapore (pop. 228,555), Penang (including Province Wellesley and the Dindings, pop. of the three, 248,207) and Malacca (pop. 95,487). These were transferred from the Indian Government in 1867 and placed under the control of the Secretary of State for the Colonies. In 1886 Cocos or Keeling Islands (pop. 640), a group of about 20 small coral islands, 700 miles S.W. of Sumatra, were placed under the Straits Settlements and annexed in 1903; and in 1889 Christmas Island (pop. 900), 200 miles S.W. of Java, was placed under the Colony and annexed to Singapore in 1900. The total area of the Straits Settlements may be estimated at 1,472 square miles. Singapore is the seat of the central Government, which is composed of a Governor, assisted by an Executive Council and a Legislative Council. The system of law is formed of the Indian Acts and local laws based upon the law of England. Most parts of the Colony are favourable as a residence to Europeans, but the population is principally Chinese or Malay. The exports consist chiefly of gutta-percha, gambier, indiarubber, pepper, horns, hides, canes, sugar, rice, sago, tapioca, spices, tea, coffee and tobacco. Pop. (1901), 572,249.

Strange, SIR ROBERT, line-engraver, whose name was properly Strang, was born at Kirkwall, in the Orkney Islands, on July 14th, 1721. He was placed in a lawyer's office in Edinburgh, but he displayed so manifest a taste for drawing that he was apprenticed for six years to Richard Cooper, the engraver. At the instigation of his sweetheart (whom he married in 1747) he took part in the Jacobite rising of 1745, and was obliged to withdraw to France, where he studied under Le Bas at Paris. In 1750 he returned to England, and soon afterwards settled in London. Here he remained till 1760, his reputation steadily rising, but,

considering himself slighted, he went again to the Continent where, especially at Rome, he was received with exceptional honour. In 1765 he returned once more to London, and when he found that the Royal Academy refused (1768) to give engravers any higher rank than that of Associate he declined to have anything to do with the new institution. He withdrew to Paris where he practised his art with great acceptance till 1780, when he won the favour of George III., through the interposition of his friend Benjamin West. In 1787 he was knighted and died in London on July 5th, 1792. As a line-engraver he must be placed with the finest exponents of the art, but his works are more warmly appreciated in France than in Great Britain.

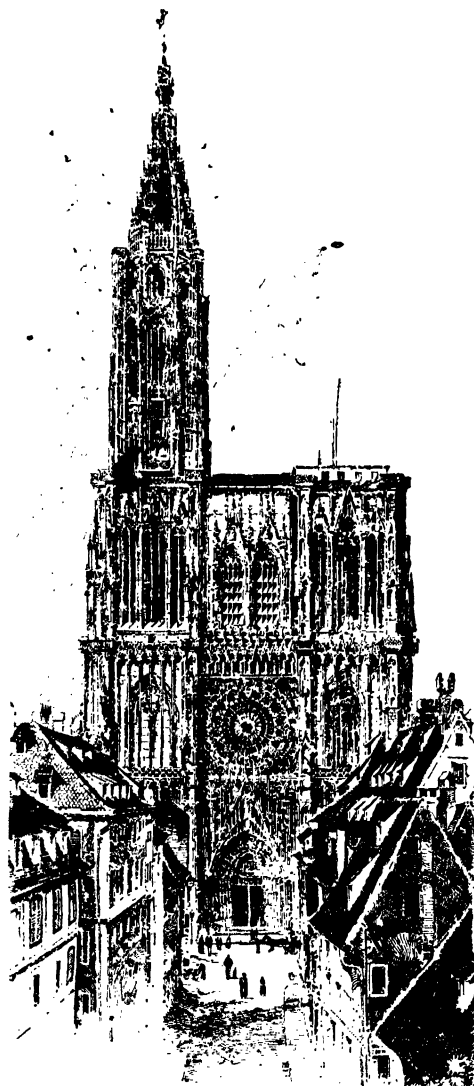
Strangles, a contagious disorder which attacks horses, and which is characterised by catarrh, affecting the nose and throat with glandular swellings. It generally attacks young animals, especially the weak and neglected. The disease begins with fever, followed by a serous discharge, and lasts for several weeks. The mortality is from 2 to 3 per cent.

Stranraer, a seaport of Wigtownshire, Scotland, at the head of Loch Ryan, 6 miles N.E. of Portpatrick. The chief structures are the old town hall, the county buildings and the mediæval castle which was occupied by Graham of Claverhouse when, as Sheriff of Galloway, he was harrying the Covenanters. The principal industries are the fisheries, brewing, milling and nursery gardening. The once considerable oyster-fishery has ceased to be profitable but might, with proper attention and enterprise, be revived. There is a brisk shipping trade in cattle and dairy and agricultural produce. Stranraer is the terminus of the shortest sea-route to Belfast *via* Larne and is in repute as a midsummer holiday resort. Pop. (1901), 6,036.

Straparola, GIOVANNI FRANCESCO, novelist, was born at Caravaggio, in Lombardy, towards the end of the 15th century, and died at Venice about 1557. He wrote *Tredecce Piacevoli Notti* ("Thirteen Pleasant Nights") (1550-4), a collection of seventy-four tales supposed to be narrated in circumstances very much resembling those in the *Decameron*, from which several of the stories are taken. Among the rest, some are of Eastern origin and some are derived from folk-lore. This work was the source of "Puss in Boots" and other popular fairy-tales.

Strasburg (French, STRASBOURG; German, STRASSBURG), capital of Alsace-Lorraine, Germany, and a fortress of the first class, 1 mile W. of the Rhine and 250 miles E.S.E. of Paris. The old fortifications, designed by Vauban, were destroyed in the Franco-German War, and the town is now defended by a chain of outlying forts. Many of the houses were destroyed during the bombardment, but have been rebuilt, and are for the most part lofty, while the streets are wide and clean and the squares extensive. The river Ill and its branches are crossed by many wooden bridges. Strasburg possesses a remarkably fine 13th-century

Gothic cathedral, with a spire 466 feet high, a nave 357 feet long, while the roof is 79 feet high. The west front, 230 feet high, has three portals, richly ornamented, and having above them a round win-



THE CATHEDRAL, STRASBURG.

dow 48 feet in diameter. The astronomical self-regulating clock of Strasburg, with its figures that perform at the hour of noon, is renowned. Other buildings of note are a church, once Dominican, decorated with scenes from *The Dance of Death*; an ancient bishop's palace; the Church of St.

Thomas, containing a statue of Marshal Saxe; a Jewish synagogue, the Stadthaus, Mint, Arsenal, University, Public Library, Provincial Government House and Picture Gallery (formerly a castle). The chief productions are woollen, linen and cotton goods, machinery, carpets, gloves, pâtés-de-foie-gras, chemicals; and brewing, dyeing, bleaching, tanning, ironworking, sugar-refining, and tobacco-manufacturing are also carried on. There is an extensive trade in corn, wine and hops. Strasburg has an archbishop. The town—then called Argentoratum—was a stronghold of the Romans against the Germans, and afterwards passed into the possession of the latter. In the Middle Ages it was a free town and a republic, but in 1681 it was seized in time of peace by Louis XIV., and remained French till the Franco-German War of 1870. Pop. (1900), 151,041.

Stratford-on-Avon, a town of Warwickshire, England, 8 miles S.W. of Warwick. It is beautifully situated on the Avon, which is here crossed by two bridges, one of them being of stone with fourteen pointed arches. Holy Trinity, a fine cruciform church, portion of which dates from the early part of the 14th century, contains the tomb and bust of Shakespeare, who was born and died in the town. Other important buildings are the Free Grammar School (founded in 1482), the Town Hall, the Guildhall, the Shakespeare Memorial Theatre, with Library and Picture Gallery, the Shakespeare Fountain and Clock-tower presented in 1887 by G. W. Childs of Philadelphia, and New Place on which stood the mansion which Shakespeare purchased in 1597 and which was demolished in 1702. There is a memorial statue of the dramatist, presented by the sculptor, Lord Ronald Gower, in 1888. The town is a well-known place of pilgrimage to lovers of Shakespeare, and though the house in which he died has been destroyed, that in which he was born still exists, and is now a museum of Shakespearean relics. A short distance west of the town, at Shottery, stands the lovely thatched cottage of Anne Hathaway, which was acquired for the nation in 1892. Pop. (1901), 8,310.

Stratford de Redcliffe, STRATFORD CANNING, VISCOUNT, diplomatist, was the son of Stratford Canning, a London merchant, and first cousin of George Canning, and was born in London on November 4th, 1786. He was educated at Eton and King's College, Cambridge. He became first secretary to the Embassy at Constantinople in 1808, and Minister-plenipotentiary in 1810. As Minister-plenipotentiary in Switzerland (1814-19) he took part in arranging the federation of the cantons. After a special mission to the United States (1820) he went as ambassador to Constantinople in 1825, and entered into those negotiations on behalf of Greece which culminated in the treaty of Adrianople (1829). Greek affairs again took him to Turkey in 1831. During his final residence in Constantinople, which lasted sixteen years (1842-58), he gained a complete hold over the Sultan, earning by his power the title of "Great Elchi." He secured important privileges for the Christian subjects of the Porte, and was extraordinarily

successful in baffling Russian intrigue. Yet he was powerless to prevent the Crimean War, although his previous policy put Russia altogether in the wrong. He was created Viscount in 1851 and K.G. in 1869. After his return to England he lived in retirement, though occasionally speaking in the House of Lords on foreign policy. He died at Frant in Sussex on August 14th, 1880.

Strathclyde, a kingdom formed by Romanised Britons after the Anglo-Saxon Conquests. It extended from the Clyde to the Ribble (in Lancashire), and its capital was Dumbarton. The kingdom of Northumbria bounded it on the east. The Danes overran the southern district in the 9th century. Early in the following century it submitted to Edward the Elder and the northern half was ceded to Scotland by Edmund in 945.

Strathnairn, HUGH HENRY ROSE, 1ST BARON, Field-marshal, third son of Sir George Henry Rose, Minister-plenipotentiary, was born on April 6th, 1801, in Berlin, where he was educated, receiving his earliest military training at the Cadet School. He obtained his commission on June 8th, 1820, joined the 19th Foot and was promoted lieutenant in the following year. In 1840 he was selected for special service to effect the expulsion of Mehemet Ali's Egyptian army from Syria and the restoration of the Sultan's rule. After distinguishing himself, he succeeded to the command of the British troops in Syria, being gazetted Consul-General on August 20th, 1841. While fulfilling his duties he was the means of saving the lives of hundreds of Christians by his forcible appeals to the Druses. Lord Palmerston recognised his services by appointing him secretary to the Embassy at Constantinople, January, 1851, and in Sir Stratford Canning's absence he became *chargé d'affaires*. When Great Britain and France declared war against Russia in 1853, Rose drew up a plan for the invasion of the Crimea, and at Inkerman, where his horse was shot under him, the Russians were so impressed by his fearless ride along the line of their pickets, under a withering fire, that an order was magnanimously given to cease firing at him. He volunteered for service on the outbreak of the Indian Mutiny and reached Bombay on September 19th, 1857. Though he was overshadowed by his chief, Sir Colin Campbell, the force under his command practically reconquered Central India owing to his skilful handling. Rose was on sick leave when tidings reached him of the defection of Sindia's troops. Resuming command he moved rapidly upon Gwalior, then occupied by Tantia Topi, captured the city and stormed and took the fortress on June 20th, 1858. He was gazetted G.C.B. and the thanks of both Houses of Parliament were voted to him for his eminent services on April 14th, 1859. On June 4th, 1860, he succeeded Lord Clyde as Commander-in-chief in India. His administration was marked by the improved discipline he introduced and by the success with which he effected the amalgamation of the Queen's and the Company's forces. He returned to England in 1865 and was given the command of the forces in Ireland, where he prevented conspiracy from ripening into rebellion.

On July 28th, 1866, he was raised to the peerage; he was promoted Field-marshal on June 2nd, 1877, and he died, unmarried, on October 16th, 1885.

Stratification, the arrangement of rocks in layers, the result of deposit. Though volcanic ashes may be stratified, and even lavas interstratified, or poured out on or between beds, stratification is mainly confined to sedimentary or aqueous rocks. Deep or open-sea deposits, or others in which the nature of the sediment continues long unvaried, are likely to be in thick beds, such as some freestones; whilst estuarine or shore deposits, laid down under the influence of changing currents, frequently vary repeatedly in composition, forming a succession of thin-bedded layers, such as Penarth beds in the Trias, the Purbeck series, or the Woolwich beds. There is generally some absence of cohesion being two successive strata, especially if of different composition, and thus planes of bedding may form lines of passage not only for underground waters, but also in some cases for intrusive igneous rocks. Individual strata may range in thickness from an inch to many feet, and a stratum may be subdivided by planes of lamination. [SHALE.] Beds will generally be greatest in thickness and coarsest in texture near the source of the sediment, becoming finer and thinner as they recede from it; and the coarser the rock in grain, the more local it will be, as a rule, in area. By the thinning out of beds of one kind the general lithological character of a series may change totally in a small horizontal distance.

Stratigraphy, or STRATIGRAPHICAL GEOLOGY, that department of geology which arranges the rocks, especially the sedimentary ones, in chronological succession, and endeavours to trace the sequence of physical events of which they constitute the record. It thus, to a great extent, is the summation and application of the results of the other branches of the science. In establishing the order of superposition of strata, fossils are of the greatest utility, each species or group of organisms increasing from its first appearance to its culminating point of abundance, and then sooner or later declining, before the absence of higher types, until it may disappear, in which case it never reappears. Thus the relative abundance of a species or genus may be of the greatest use in demarcating a zone or horizon in a thick uniform series of rocks. The Ammonites have been largely employed for this purpose among thick uniform series of Secondary rocks, such as the Lias clays or the Chalk. Similarly an abrupt change in the fossils, such as that between the lower and upper parts of the Elgin Sandstone, may represent a considerable break in the succession of the rocks (in this case, between Old Red and New Red Sandstone), though there may be no marked unconformity; and *vice versa*, the absence of any such change may show that even a considerable local unconformity does not represent any great lapse of time. The geological record is necessarily so imperfect that it is fairly easy to subdivide the rocks formed into successive divisions. It is proposed by the International Geological Congress to adopt the following terms

for the various grades of subdivision among rocks and in the time taken to form them, beginning with the most comprehensive division :—

Group	...	...	Era, e.g., Mesozoic.
System	...	...	Period, e.g., Cretaceous.
Series	...	...	Epoch, e.g., Neocomian.
Stage	...	...	Age, e.g., Upper Neocomian.
Beds	...	...	e.g., Folkestone Beds.

Strauss, DAVID FRIEDRICH, theological critic, was born at Ludwigsburg in Württemberg on January 27th, 1808. After studying at the University of Tübingen, where the seeds of scepticism were planted in his mind by the teaching of Baur, he was ordained in 1830, and in 1831 visited Berlin to attend the lectures of Hegel and Schleiermacher. Returning to Tübingen in 1832, he devoted his time mainly to his *Leben Jesu Kritisch Bearbeitet* ("Life of Jesus Critically Examined"), the first volume of which appeared in 1834 and the second in the following year. It marked the beginning of a new epoch in Biblical criticism. His appointment to the chair of theology at Zürich (1839) excited so much uproar that he was dismissed with a pension, but this step did not prevent the overthrow of the Government. After a brief political career in 1848, in which he disappointed his revolutionary supporters, he devoted himself entirely to literature. Of his other works the most important were *Die Christliche Glaubenslehre* (1840-1) and *Der Alte und Der Neue Glaube* (1872). He died at Ludwigsburg on February 8th, 1874.

Strauss, JOHANN, the elder, composer, son of an innkeeper, was born at Vienna on March 14th, 1804. He was apprenticed to a bookbinder, but his passion for music impelled him to run away, and only when his father agreed to his cultivating his natural gift was he persuaded to return home. At fifteen he entered a small orchestra of which, as their number and engagements increased, he became deputy-conductor. In the Carnival of 1826 his *Tüubel-Walzer* was produced, quickly followed by the *Kettenbrücken-Walzer* and others which immediately made his reputation. He was appointed Capellmeister of the 1st Bürger-regiment and entrusted with the duty of providing music for the Court fêtes and balls. His band being continually in request he increased its numbers to 200, forming a select body to play music of the highest class. In 1833 he started on the first of his many tours; in October, 1837, he visited Paris, London, and the larger English and Scottish towns. His band performed at the numerous festivities held in honour of Queen Victoria's coronation in 1838 and he did not return to Vienna until December, ill through fatigue and the anxieties attendant upon the prolonged journey. Strauss made several other successful tours and revisited England in 1849. Soon after his return to Vienna he caught scarlet fever and died on September 25th, his funeral being an impressive demonstration on the part of the vast number of his Viennese admirers. He raised dance music to a higher position than it had ever reached and his abilities were recognised by greater musicians than himself, such as Cherubini. He is often inaccurately described as the inventor of the waltz. Of his 251 works, 152 comprise waltzes full

of life and merriment whose movement is irresistible. It is to be remembered to his honour that he constantly endeavoured to elevate the taste of his audiences by the introduction of classical music into his programmes. In 1824 Strauss married Anna Streim, an innkeeper's daughter, and of his five children three also became celebrated musicians. **JOHANN**, the eldest, often called the "Waltz King," was born in Vienna on October 25th, 1825. His father, remembering the opposition he had encountered, strongly objected to his children becoming musicians. Johann became a clerk in a savings bank, but with the secret assistance of his mother was able to study composition and the violin and at length overcoming parental resistance made his *début* as a conductor on October 15th, 1844. His success decided his future. On his father's death he incorporated their bands and undertook professional tours and as a composer was more prolific than the elder Strauss. Their waltzes each made a tour of the Continent. The waltzes of the younger Strauss are of as high a class as his father's; *Am der schönen blauen Donau*, probably the most celebrated, became the rage of Europe. His first operetta, *Indigo*, was produced in 1871 and was followed by *Die Fledermaus* and a number of other works. On October 15th, 1894, his jubilee was enthusiastically celebrated. He died on June 3rd, 1899. **JOSEPH**, the second son, born on August 22nd, 1827, became an architect, but studied music secretly and also achieved success as a conductor and composer. He died on July 22nd, 1870. **EDUARD**, the third son, born on February 14th, 1835, was intended for the diplomatic service, but inclination constrained him to become a musician and he made his first appearance in 1862. As his elder brothers had done he, too, formed an orchestra and during his tours visited England in 1885 and 1897. His compositions are likewise numerous and effective.

Strauss, RICHARD, composer, was born at Munich, Bavaria, on June 11th, 1864. He became Director of Music at Meiningen in 1885 and at Munich in 1886; Court Music Master at Weimar in 1889 and at Munich in 1895 and at a later date was appointed Conductor to the Royal Opera House in Berlin. Some of his compositions have aroused considerable controversy, but he is regarded as one of the most gifted of contemporary composers. Among his principal works are the symphonic poems, *Don Juan*, *Till Eulenspiegel*, *Tod und Verklärung*, *Macbeth*, *Also sprach Zarathustra*, *Ein Heldenleben* and *Sinfonia Domestica*.

Straw, the dry stalks of certain cereals and of beans and peas. Being rich in silica, they are consequently of a stiff texture. It is largely employed industrially in the making of straw hats and bonnets.

Strawberry (*Fragaria*), a small genus of rosaceous plants, comprising three or four widely-distributed species. They produce runners, have adnate stipules and, generally, ternate leaves, an epicalyx of five leaves, and a remarkable fleshy outgrowth from the floral receptacle carrying the

numerous achenes with their persistent lateral styles upon it in a spiral. The fragrance of this fruit, or rather pseudocarp, and the custom of putting straw under the fruit in wet weather are the origins of its name. Strawberries were certainly cultivated before the time of Holinshed, if not before that of Richard III. (*see* Shakespeare's *Richard III.*, act iii. scene 4), *F. vesca* being a common wild plant throughout Europe, Northern Asia, and North America. The hautbois (*F. elatior*), with spreading hairs on the flower-stalks and short stalks to the leaflets, sometimes found wild, is probably only a cultivated variety of *F. vesca*, which has escaped from gardens. *F. virginiana*, the scarlet or Virginian strawberry, introduced in 1629, and *F. grandiflora*, the pine strawberry, introduced from Carolina, are the origin of many of the cultivated sorts. *F. chilensis*, introduced from Chile to France in 1712, is largely grown in France, and has been used for crossing with other forms in the United Kingdom. Hundreds of tons of strawberries in London alone are sold annually, Kent being the chief centre of their cultivation for the metropolitan market.

Street, GEORGE EDMUND, architect, third son of Thomas Street, solicitor, was born at Woodford, Essex, on June 20th, 1824. He spent a few months in his father's office and found the work distasteful. His father's death left him free and in 1841 he began his studies as an architect under Owen Carter at Winchester. He became an accomplished ecclesiologist and was taken as an assistant into the office of Sir Gilbert Scott where he worked for five years. In 1849 he took an office on his own account and was soon actively engaged in designing ecclesiastical buildings and in restoration. A draughtsman of a high order, his taste led him to the 13th-century Gothic and his Continental studies proved valuable in the work he undertook. In 1852 he settled in Oxford, where Edmund Sedling and Philip Webb became his pupils. He designed the theological college at Cuddesdon, the convent at East Grinstead (for which he refused to accept remuneration) and the beautiful church of St. Peter, Bournemouth. In 1855 he returned to London. Among the many commissions he undertook the most important were the new nave of Bristol Cathedral; the choir of Christ Church Cathedral, Dublin; the friary at Carlisle, and the new Courts of Justice in London, to the last named of which, after a long controversy, he was appointed sole architect in June, 1868. For this important building, which marks the culmination of his career, he himself made 3,000 drawings; he was hampered by want of space and by the parsimony of the First Commissioner of Works, who even reduced Street's remuneration. Yet so conscientiously did he fulfil his instructions that, when finished, the cost of the structure proved to be £2,000 less than the amount authorised. Anxieties connected with the erection of the law courts affected his health and he died on December 18th, 1881, before his greatest work was completed. He was buried in Westminster Abbey. *The Brick and Marble Architecture of Northern Italy*, published

in 1855, was the result of a tour made two years earlier. He made three journeys into Spain gathering materials for his *Gothic Architecture in Spain*, published in 1865; he became A.R.A. in 1866, R.A. in 1871, and in 1881 president of the Royal Institute of British Architects and professor of architecture at the Royal Academy. He was twice married and the works that were unfinished at his death were mainly completed by his only son, Arthur Edmund Street.

Strength of Materials. A substance will break when it is strained beyond a given point, and this limiting value of the strain is what is understood by the strength of the materials. This strength varies with the kind of strain. A rod of metal may be pulled or crushed, the strength being often the same in both cases, or it may be twisted, in which case the substance generally breaks down sooner—i.e., its resistance to shearing is less than to tension. The following table gives the strength of various substances:—

SUBSTANCE.	BREAKING WEIGHT	
	IN LBS.	PER SQ. INCH SECTION.
Cast steel	120,000	(tension)
Wrought iron (bar)	50,000	
Cast iron	88,900 to 125,000	(crushing)
" " " " " " " "	14,800 to 16,500	(tension)
Cast copper	19,000 to 26,000	"
Copper wire may stand as much as	60,000	"
Bronze containing 12 parts copper to 1 part tin	29,000	"
Brass containing 7 parts copper to 34 parts zinc	32,000 to 39,000	"
Aluminium bronze containing 10 parts aluminium to 90 parts of copper	100,000	"
Aluminium bronze (rolled)	120,000	"
Timber—Beech	11,500 to 22,200	(tension)
" " " " " " " "	9,363 to 7,733	(crushing)
" Mahogany	8,000 to 21,800	(tension)
" " " " " " " "	8,300	(crushing)
" English Oak	15,000	(tension)
" " " " " " " "	6,500 to 10,000	(crushing)
" Teak " " " " " " " "	8,200 to 15,000	(tension)
" " " " " " " "	12,100	(crushing)

Beams of the following timber 1 foot long, and supported at both ends, will just give way under the following weight, calculated for a sectional area of 1 square inch:—

Beech	518 to 677 lbs.
Mahogany	425 to 610 lbs.
Oak	557 to 964 lbs.
Teak	820 to 1,075 lbs.

Streptoneura, a division of the unsymmetrical Gasteropoda, including those in which the nerve cords of the viscera are twisted. The group includes the great majority of the common univalve mollusca. It is classified as follows:—

1. ZYGORANCHIA: both ctenidia (gills) present or aborted.
 - a. CTENIDIORANCHIATA, e.g., *Haliotis* (Venus's Ear Shell) and *Fissurella* (Key-Hole Limpets).
 - b. PHYLLIORANCHIATA: *Patellidae* (Limpets).
2. AZYGORANCHIA: Left ctenidia only retained.

- a. REPTANTIA. Foot adapted for creeping.
1. *Holochlamyda*, e.g., *Trochus* (Top Shells), *Paludina* (Pond Snail), etc.
 2. *Pneumono-chlamyda*, e.g., *Cyclostoma*.
 3. *Siphonochlamyda*, e.g., *Cypræa* (Cowry), *Conus* (Cone-Shells), *Buccinum* (Whelk), etc.
- d. NATANTIA: Pelagic and free swimming.
1. Atlantacea.
 2. Carinariacea.
 3. Pterotracheacea.

Strickland, AGNES, historian, was born at Reydon Hall, near Southwold, in Suffolk, on August 19th, 1796. She early showed a gift for writing, her first publications being volumes of verse, but none of these books became popular, although *The Seven Ages of Woman* (1827) passed through more than one edition. Turning her attention to prose she was more successful and her *Lives of the Queens of England* (1840-8), in which she was assisted by her sister Elizabeth (1794-1875), gained a wide and permanent circulation. This was followed by the *Letters of Mary Queen of Scots* (1842-3) and *Lives of the Queens of Scotland* (1850-9). In 1865 she essayed a novel *How will it end?* In 1870 was granted a Civil List pension of £100 a year and died at Southwold on July 13th, 1874. Her sister, who had an invincible objection to publicity, wrote in a more robust style.

Stricture, the narrowed and constricted condition which is sometimes met with in the urethra, and more rarely the œsophagus, rectum, or other natural passage of the human body. Stricture of the urethra usually occurs as a result of preceding inflammation, particularly the inflammation which is caused by gonorrhœa. It may be due, in rare instances, to injury or to ulceration of the urethral mucous membrane. The results produced by stricture of the urethra, if the condition is allowed to remain untreated for a considerable length of time, are far-reaching, and productive in the majority of instances of serious disease of the bladder and kidneys. All forms of stricture are sufficiently important to call for the attention of the doctor. It would be folly to attempt to treat them empirically.

Strike, a line at right angles to the dip of beds of rock—the general direction, that is, of their outcrop—along which they appear horizontal, whatever their inclination. In folded rocks the strike will generally be the axis of the fold. On a level surface strike and outcrop coincide. In mining the strike is sometimes termed the level course or level bearing. The dip being ascertained, the strike will be known; but, though the strike may be known, the dip may be to one side of it or to the other. Thus, with an easterly or a westerly dip, the strike must be north and south; but with a north and south strike the dip may be westerly or easterly. Master-joints and faults often follow the line of strike, and escarpments are worn back at right angles to this line.

Strike, a concerted abandonment of work by a body of workmen with the object of exacting concessions from their employer or employers. When

the employer assumes the initiative, the movement is known as a lockout. The more famous strikes in modern times were the Dockers' in London (1888-9), when the labourers were conceded an advance from 5d. to 6d. (the "dockers' tanner") per hour; the unsuccessful stand of the stokers and others against the "bonus" system inaugurated by Sir (then Mr.) George Livesey, manager of the South Metropolitan Gas Company in London (1889-90); and the Penrhyn quarrymen's strike at Bethesda, which lasted from 1900 to 1903 and involved a loss in wages alone of £364,000.

Strindberg, AUGUSTE, novelist and dramatist, was born at Stockholm, Sweden, on January 22nd, 1849. Among his works of fiction are *Das rote Zimmer* (1879), *Das neue Reich* (1882), *Heirate* (1884), *Tschandala* (1889) and *Am offenen Meer* (1890). His dramas include historical plays such as *Gustav Adolf*, *Carl XII.*, *Königin Christine*, *Gustav III.*, and *Die Nachtigall von Wittenberg* and social plays like *Der Vater*. Besides several volumes of poetry, he has written, in *Die Leute auf Hemsö* (1887), an admirable account of the manners and customs of the Bothnian island folk.

Stromatoporidae, a group of extinct organisms of which the affinities have long been somewhat uncertain. There seems, however, to be little doubt that they are really Hydrozoa, and allied to some such type as *Hydractinia*. They form massive coral-like structures composed of calcareous layers concentrically arranged and separated by small vertical pillars. The group ranges from the Silurian to the Lias.

Strontium (chemical symbol, Sr.; atomic weight, 87.5) is a metallic element which, in all its chemical properties, is closely allied to the metals barium and calcium, between which it forms, as it were, a chemical mean. It was first prepared in 1808 by Sir Humphry Davy by the electrolysis of the fused chloride, though the probable existence of the metal had been pointed out 15 years before. The metal has a yellow colour, is malleable, and possesses a specific gravity of 2.5. It oxidises on exposure, and readily burns, while if thrown on to water it decomposes it with liberation of hydrogen. It occurs naturally chiefly in the form of sulphate (celestine, SrSO_4) or carbonate (strontianite, SrCO_3). It forms two oxides of formulae SrO and SrO_2 , its salts corresponding to the former of these. The hydroxide, Sr(OH)_2 , is only slightly soluble in cold, but more readily in hot water, the solution possessing an alkaline reaction. The chloride and nitrate are both soluble salts, the latter being very largely employed in pyrotechny, as it, in common with other salts of strontium, imparts a magnificent crimson colour to flames. The sulphate is only very slightly soluble in cold water and less soluble in hot, and may thus be precipitated from strontium salts by the addition of a solution of gypsum and boiling. The metal is readily recognised in its compounds by the flame coloration and by its very characteristic spectrum.

Strophanthus, a drug which has been extensively used in the treatment of cardiac disease. It

has also a diuretic action. It is derived from the poisonous principle in the seeds of *Strophanthus hispidus*, a plant native to Central Africa, where the natives employ it as an arrow-poison. A tincture of it is included in the British Pharmacopœia.

Stroud, a town of Gloucestershire, England, 10 miles S. of Gloucester. The principal buildings are St. Lawrence's Church, dating from the 14th century but rebuilt in 1868, excepting the tower and spire; the town hall, erected towards the end of the 16th century; the free library; Badbrook Hall for lectures and concerts, and the hospital. The town is the headquarters of the West of England broadcloth trade. Scarlet dyeing is also a speciality, owing to particular properties in the water of the locality. There are also brewing, iron-founding, flour-milling, and logwood-crushing, besides saw-mills, and factories for pins and sticks for umbrellas and parasols. Lypiatt Park, an ancient mansion, is said to have been one of the houses in which the Gunpowder Plot conspirators met. Pop. (1901), 9,188.

Struensee, JOHANN FRIEDRICH, COUNT, statesman, was born at Halle, Prussian Saxony, where his father was pastor, on August 5th, 1737, and studied medicine at the university of his native town. In 1768 he was appointed personal physician to the weak-minded Christian VII. of Denmark, his ascendancy over whom became complete. He subsequently gained the favour of the young queen, Caroline Matilda, sister of George III. of Great Britain, and with her aid proceeded to reorganise the institutions and administration of the country. The undue haste with which he pressed on his reforms excited the alarm of all classes, and the queen-dowager succeeded in persuading the king that his life was in danger. The queen and Struensee confessed that they had formed a guilty connection, and the latter was beheaded on April 28th, 1772. Caroline was conveyed to Celle in Hanover, where she died on May 10th, 1775.

Strutt, JOSEPH, antiquary, youngest son of Thomas Strutt, a wealthy miller, was born at Chelmsford, Essex, on October 27th, 1749. He was apprenticed to William Wynne Ryland, the engraver, when he was fourteen and in 1770-1, while a student at the Royal Academy, won one of the first silver and one of the first gold medals awarded by that institution. He became a student at the British Museum and his tastes led him to gather material for his antiquarian works, *The Illegal and Historical Antiquities of England*, 1773, the first book of its kind published in England; *Manners and Customs, etc., of the People of England*, 1774-6, and *The Chronicle of England*, 1777-8, each of which is profusely and carefully illustrated. On August 16th, 1774, he married Anne, daughter of Barwell Blower, by whom he had two sons, and after her death in 1778 he devoted himself to painting, several of his pictures being exhibited in the Royal Academy. He resumed his antiquarian researches and in 1785-6 his *Biographical Dictionary of Engravers* appeared. Ill-health and poverty

led him in 1790 to retire to Bramfield, Hertfordshire, where, while busily occupied with engraving and authorship, he employed his leisure by starting, successfully, the Sunday and evening schools which still exist. In 1795 he returned to London, his health improved and his debts discharged, and issued his valuable *Dresses and Habits of the English People*, 1796-9, and, in 1801, his classical *Sports and Pastimes of the People of England*. He began a romance of the reign of Henry VI., *Queene's Hall*, which he did not live to complete. It is of interest, inasmuch as Sir Walter Scott, when asked by John Murray, agreed to finish the tale. It appeared in 1808, and in the preface to the later editions of *Waverley* Sir Walter acknowledges that Strutt's romance proved suggestive to him. "It was a step in my advance," he said, "towards romantic composition." Strutt died on October 16th, 1802, and was buried in St. Andrew's Churchyard, Holborn, London.

Strychnine, an exceedingly poisonous alkaloid which occurs chiefly in the seeds of *Strychnos nux-vomica* and *Strychnos Ignatii* or St. Ignatius' bean. From either of these sources, usually the former, the compound is obtained by extraction with boiling dilute alcohol and treatment with various reagents to get rid of other constituents. When finally crystallised from hot alcohol, it forms four-sided bright rhombic prisms, which melt at 204° and possess a most intensely bitter taste. The compound itself is only slightly soluble in water, but it acts as a basic substance, forming salts with acids, many of which dissolve readily, and all of which are, like the strychnine itself, characterised by the bitter taste. The preparation of this alkaloid contained in the British Pharmacopœia is the *Liquor strychnine hydrochloratis*, the dose of which is about 5 minims. It acts as a tonic, stimulates the respiratory centre to increased activity, and augments the excitability of the motor centres of the spinal cord. It is hence often employed in certain diseases of the respiratory organs and in some forms of paralysis. The Liquor is often administered hypodermically, in doses of 1 or 2 minims, for its tonic and stimulant action on the heart, with a view to its exciting the respiratory centre. The symptoms produced, when a poisonous dose of strychnine has been taken, are muscular twitchings, culminating in violent convulsive movements. The treatment of strychnine poisoning consists in attempting to get rid of the poison, if it has not been already absorbed, by emptying the stomach, and in some instances the administration of chloroform by inhalation has been practised with a successful result. When, however, the strychnine has been taken in considerable quantity, a fatal result quickly supervenes.

Strype, JOHN, ecclesiastical historian, youngest child of John Strype or van Strÿp, was born in Houndsditch, London, on November 1st, 1643. Educated at St. Paul's School and at Jesus College and Catherine Hall, Cambridge, he afterwards took holy orders. In 1669 he was presented to the perpetual curacy of Theydon Bois, Essex, which he left in November to become minister of Low

Leyton in the same county. He was licensed to perform the full office of priest and curate in 1674 and, although never instituted, continued in undisturbed possession of the benefice until his death. In addition he held the lectureship of Hackney from 1689 until 1724 and in 1711 was presented to the sinecure rectory of West Tarring, Sussex. His last years were spent at Hackney, where he lived with his granddaughter and her husband, Thomas Harris, surgeon, and, having survived his wife and both children, he died on December 11th, 1737, and was buried in Leyton Church. Until he was fifty he devoted himself to the collection of documents and materials, occasionally by doubtful means. These were the basis of his writings on the Reformation period, *Annals of the Reformation in England*, and *Ecclesiastical Monuments*, his last and best work. The many biographies he wrote include Lives of Archbishops Cranmer, Grindal, Parker, and Whitgift. He also published several sermons and an enlarged edition of Stow's *Surrey of London*. His writings and lengthy appendixes are uncritical and tedious, but his transcriptions from old documents and the facts he accumulated render his work valuable to the student of history.

Stuart. [STEWART.]

Stubbs, WILLIAM, historian, was born at Knarborough in Yorkshire on June 21st, 1825, and educated at Ripon grammar school and Christ Church, Oxford. He was elected to a fellowship at Trinity, and, after long holding a college living, was appointed professor of modern history at Oxford (1866-84), and occupied the see of Chester from 1884 to 1889, when he was translated to Oxford. His *Constitutional History of England*, an epoch-making work, was published in three volumes between 1874 and 1878. His other works include a collection of mediæval chronicles for the Rolls Series with valuable prefaces, *Select Charters and Other Illustrations of English Constitutional History* (1870), and *Lectures on the Study of Mediæval and Modern History* (1886). He died at Cuddesdon near Oxford on April 22nd, 1901.

Stuffing-Box, a contrivance for making a joint air-, water-, or steam-tight, when it is required to pass a movable rod out of a vessel or into it. It consists of a close box, cast solid with the cylinder-head, with a hole through which the piston-rod passes. In the box is placed, around and in contact with the rod, hemp or indiarubber packing, lubricated and compressed by screws, so as to force the packing into every crevice. The stuffing-box is used, *inter alia*, in steam-engines, pumps and on the shaft of the screw where it passes through the stern.

Sturdy, or GID, a disease of sheep, due to the presence in the brain of a parasite, the embryonic form of the dog's tapeworm (*Tenia cœnurus*). The affected animal displays a tendency to stagger (hence the disease is often called the staggers), move sideways, or sit down, and also shows signs of stupor. The disease generally attacks sheep which are two years old and under and is practically incurable.

Sturgeon, a fish belonging to the Acipenseridæ, a family of cartilaginous Ganoid fishes, having five rows of bony plates on the long cylindrical body. The snout is produced, and the under-jaw bears four barbules. The tail is unsymmetrical, and the anal and dorsal fins are far back. They are found in the North temperate zone, and either live in fresh water or resort to rivers to spawn. Many of them are of large size, and their flesh is valued as food. Caviare is prepared from the roe, and isinglass from the inner coats of the swimming-bladder. Sturgeons feed on worms and shell-fish, which they obtain by routing with their snouts. The type-genus (Acipenser) has about twenty species from the rivers of Europe, Asia, and America. The Common Sturgeon (*A. sturio*) often occurs round the British coasts and in the estuaries of the rivers. From six feet to ten feet is about the average length, but larger specimens are recorded. The general colour is greyish above and silvery-white below. In England it has been one of the fishes-royal since the 14th century. Other species are the Sterlet (*A. ruthenus*), the Hausen (*A. huso*), the Chinese Sturgeon (*A. sinensis*). The genus Scaphirhynchus, with four species from Asia and America, has a flat snout.

Sturm, JOHANN, Reformer and educationist, was born at Schleiden, in the duchy of Luxemburg, on October 1st, 1507, and studied at Leyden, Louvain and Paris. Compelled to leave Paris, owing to his religious opinions, in 1536, he retired to Strasburg, and in 1538 became rector of the new gymnasium in that town. Here he was enabled to carry out his educational projects, which were completed in 1564 by the addition of an academy to the gymnasium, the two together comprising a school and a university. He supported Zwingli, and was engaged in constant disputes with the Lutherans of Strasburg, where he died on March 3rd, 1589.

Stuttgart, the capital of the kingdom of Württemberg, Germany, about 1½ mile from the left bank of the Neckar, 97 miles S.S.E. of Frankfurt-on-Main. It is surrounded by vineyards, and consists of an Upper Town, with wide streets and squares, and the old part or Lower Town. Among the places of interest are the new and old palaces, two Gothic churches, a library noted for its numerous editions of the Bible, Stadthaus, Parliament House, schools, hospitals, and the Royal Stud, which contains 300 horses. Stuttgart is a great seat of the book trade, and produces all the appliances necessary for it. Other industries are the manufacture of linen, woollen, silk, cotton, gloves, leather, gold embroidery, vinegar, beer; and tin, metals, and castings are largely worked. There are fine alleys, parks, and gardens, and in the neighbourhood are Rosenstein, with the royal summer residence, and Cannstadt, noted for its mineral springs. The town received its name from a castle in 1089, obtained municipal rights in 1119, and in 1320 became the residence of the Counts of Württemberg. Pop. (1900), 176,699.

Style, the tubular portion of the carpel of angiosperms, that in many cases, but not always.

intervenes between the stigma, or viscid receptive surface, and the cavity of the ovary. When the style is absent, as in poppies, the stigma becomes sessile on the ovary. When there are several united carpels forming distinct chambers to the ovary, as in lilies, there may be only one style; or there may be as many as the carpels, as in grasses; or there may be one below, dividing above, as in Iris and the Compositæ. The style generally rises from the apex of the ovary (terminal), but sometimes, from the growth of the ovary, it becomes lateral, as in the strawberry, or even basilar. In Labiata and Boraginaceæ the united styles of the four-chambered ovary arise laterally and unite from a central depression, and are called gynobasic. Though generally rod-like, the style may be petaloid, as it is, at least in part, in the Iridaceæ. When the styles are of different lengths in different individuals of the same species, it may be of importance in cross-pollination. [HETEROSTYL.Y.] The tube or canal of the style is generally filled with loosely-arranged cells forming the conducting-tissue; but in some cases it is empty. After flowering the style is commonly deciduous; but it persists in the fruit stage in strawberries, blackberries, hound's tongue, clematis, etc.

Style, Old and New. [CALENDAR.]

Stylites, SIMEON (*circa* 390-460), the first "pillar-saint" (Greek, *stylites*), was born near Antioch. After spending some twelve years in monasteries he withdrew to a lonely Syrian mountain, and there devised the system of penance from which he took his name, living for thirty or forty years on the top of a pillar, the height of which was gradually increased to about 70 feet.

Stylommatophora, one of the two groups of Mollusca forming the Pulmonata. It is characterised by the fact that the eyes are situated on the extremities of a pair of tentacles, which may be retracted or expanded at will. The group includes many well-known Mollusca, such as the snails *Helix*, *Pupa*, *Clausilia*; the slugs *Arion*, *Limax*, *Testacella*, etc.

Styptics, substances employed to check the flow of blood from a wound. They include cold, mechanical and other forms of pressure, actual cautery at a dull heat, alum, cotton-wool soaked in hamamelis or tannic acid, and collodion.

Styria, or STEIERMARK, a duchy and crownland of Austria, 124 miles long by 112 broad, and containing 8,670 square miles, and having Upper and Lower Austria on the N., Carniola on the S., Hungary and Croatia on the E., and Carinthia and Salzburg on the W. It is chiefly mountainous, belonging to the Noric and Carnic Alps, which send out three chains, reaching in the north-west a height of 7,700 feet (Grimming) and in the south-west 8,000 feet (Eisenhut). There are many valleys among the mountains, and in the south-east, in the neighbourhood of the Mur and Drave, the land is level. The rivers Enns, Mur, Drave, and Save belong to the Danube basin. There are many small beautiful lakes. The lowlands are fertile, and produce good wine, fruit, flax, hemp, and poppy,

besides oats, wheat, maize, rye, and turnips. The live-stock includes cattle, sheep, horses, goats, and pigs. Extensive forests afford splendid timber for export and fuel for the smelting of metals. Among minerals are iron of good quality and in abundance, copper, cobalt, lead, zinc, gold, silver, sulphur, alum, and rock-salt. The manufacture of edged tools is important. Graz (138,080) is the capital. The population is mostly German, except in the south, where the Slavonic element predominates. Pop. (1900), 1,356,494.

Styx, a river of Greek and Roman mythology, situated in the infernal regions, across which the dead were ferried by Charon, and by which the gods swore an inviolable oath. It was said to go nine times round hell, and Milton speaks of it as the "flood of burning hate." The real Styx is a rivulet in Arcadia, whose waters are said to be pernicious, and its modern Greek name embodies this idea.

Suakin, a port of the Anglo-Egyptian Soudan, on the western coast of the Red Sea, situated in 19° N. and 37° 30' E. Part of the town is on the mainland, but the major portion is on a small island. Its harbour is well fortified. The principal buildings are mosques, bazaars, the custom-house, training college and Governor's residence. There are local industries in silver-ware, leather goods, cutlery and spears, and a brisk export and import trade is carried on, the former comprising cattle, hides, gums, ivory, gold and grain; the latter cottons, sugar, flour, ghee, coal and rice. Pop. (estimated), 22,000.

Suarez, FRANCISCO, theologian, was born at Granada in Spain on January 5th, 1548, and studied at the University of Salamanca. He entered the Society of Jesus and in 1597 became professor of theology at Coimbra. As a schoolman he attempted to reconcile the views of Realists and Nominalists regarding Universals. In theology his *Congruism* was a development of the views of Molina. His *Tractatus de Legibus ac Deo Legislatore* claims a divine origin for all laws, but combats the divine right of kings. The *Defensio Catholica Fidei* (1613) was written in opposition to the claims of sovereignty put forward by James I. of Great Britain. He died in Lisbon on September 25th, 1617.

Sublimation. Many solids can be distilled in the same way as liquids; the application of heat transforms them into vapour. When the vapour comes into contact with a cold surface, a deposit of the solid occurs, which is known as a sublimate, and the process of direct conversion of vapour to solid is known as sublimation. Many substances are purified in this way—*e.g.*, arsenious acid, sulphur, corrosive sublimate, etc. Some vapours condense in the form of powders called flowers and thus we obtain flowers of sulphur, flowers of benzoin and the like.

Submarine Boat, a vessel designed for navigation beneath the surface of the sea, and employed in time of war for the purpose of discharging torpedoes from an unknown quarter. Since such a type has not been thought of in any other connection, it is reasonable to infer that the boat has no

place in any scheme of civilisation. The submarine is roughly cigar-shaped and equipped with compressed air tanks for her crew, accumulators and motor, and an appliance whereby certain parts may be detached at once to enable her to rise in the event of mishap. She should not sink beyond 30 feet or thereabouts since the field of vision becomes untrustworthy at a greater depth, and she ought to be able to remain below for long periods during a full day. In the earlier vessels hand power was used instead of mechanical, the principal inventors being either Americans or Frenchmen. In 1775 David Bushnell (1742-1824) tried his *American Turtle* against the British *Eagle*, but nothing came of the attempt. In 1801, encouraged by Napoleon, Robert Fulton (1765-1815) experimented in France. During the Civil War the Confederates sank the *Housatonic* in 1864, but the submarine went down, too. Amongst other types were the *Plongeur* of Charles Brun (1863), Nordenfelt's steam-propelled Swedish boat (1883), M. Goubet's torpedo-boat (1881), M. Laubeuf's *Narval*, with a submerged speed of 8 knots (11 knots on the surface) an hour, and J. P. Holland's *Plunger* (U.S.A., 1903).

Subpœna, a writ issuing out of a Court having jurisdiction therefor, by which persons are commanded to appear at a certain place to give evidence under a heavy penalty for disobedience. It is the means by which evidence is brought for consideration in a pending action or other proceeding.

Substance, in theology, the Divine Being, or Essence, common to the Three Persons of the Trinity.

Succinic Acid is a compound which possesses the formula $C_4H_6O_4$, and may be chemically named ethylene dicarboxylic acid. It occurs naturally in a number of sources, as in amber and other resins, in various plants, and, in small quantities, in animal organisms. It is also a product of various kinds of fermentation—e.g., in small quantities in the ordinary alcoholic fermentation of sugars. Synthetically it may be obtained by very many reactions which, together with its chemical properties, prove its constitution to be that represented by $(CH_2 \cdot CO_2H)_2$. It is soluble in water, almost insoluble in alcohol, and easily soluble in ether. It forms crystals belonging to the Monoclinic system, which melt at 180° , but decompose if heated much higher. If added to solutions of ferric salts, it causes a precipitate of ferric succinate, and this reaction is made use of in the separation of iron from manganese salts. It forms a large number of important organic derivatives, amongst these being the compound asparagine, which occurs in asparagus, beans, peas, beetroot, and other plants. An acid known as iso-succinic acid possesses the same composition as succinic acid, the difference being due to a difference of constitution. It may be distinguished by its more ready solubility in water and lower melting-point (130°).

Suchet, LOUIS GABRIEL, DUC D'ALBUFERA, general, was born at Lyons in France on March 2nd, 1770. He was at first intended for his father's

trade of silk-weaving, but joined the army on the outbreak of the Revolution. After distinguishing himself in Italy (1796-7), in Egypt (1798), in Italy again (1798-1801), and in the campaigns against Austria (1805) and Prussia (1806), he was given the chief command in Aragon (1809) and within two years brought the province completely under his control. He was created Count in 1808, Marshal of France in 1811 and, after the conquest of Valencia in 1812, Duc d'Albufera. He rejoined Napoleon during the Hundred Days and consequently was deprived of the peerage which had been conferred upon him by Louis XVIII. He died at the Château of St. Joseph Montredon, near Marseilles, on January 3rd, 1826.

Sucking-Fish, a name for the Remora. The term is used also of other fishes in which the fins are modified to form a suctional disc.

Suckling, SIR JOHN, poet, was born at Whittou in Middlesex on February 10th, 1609, and studied at Trinity College, Cambridge. He was knighted in 1630. After travelling on the Continent and serving ten months under Gustavus Adolphus (1631-2), he earned great reputation at Court as a poet, wit, and leader of fashion. During the Civil War he raised a troop of horse to serve against the Covenanters, but was driven back with the other royal forces at Duns. In consequence of a plot to release Strafford with French aid, he withdrew to Paris, where he is said to have committed suicide in May or June, 1642. His dramas have no great merit, but he wrote many exquisite lyrics, the "Ballad upon a Wedding" being a masterpiece.

Suction Pump. [PUMPS.]

Sudamina, or MILIARIA, small vesicles, the size of millet seed and looking like dewdrops on the skin, due to obstruction of the sweat ducts in diseases characterised by much heat and profuse sweating, such as typhoid fever, acute rheumatism and acute pneumonia. When they occur they are merely incidents of the disease and need cause no alarm. The parts usually affected are the chest and belly, though they may form wherever there is stoppage of the ducts. They are close together as a rule, but seldom confluent. They undergo no change and disappear of themselves in a few days. It is only when the retention of the sweat is complicated by inflammation (*Miliaria rubra*) that dusting with a little protective powder and the application of a cooling ointment may be necessary. One curious circumstance is pointed out by Malcolm Morris in his *Diseases of the Skin*. Sudamina sometimes occur "on a dry and hot skin where perspiration, so far from being excessive, has been deficient."

Sudan. [SOUDAN.]

Sudarium, a handkerchief, specifically that attached to a pastoral staff. The word also particularly applies to the handkerchief of St. Veronica which, according to tradition, was miraculously impressed with the features of Jesus.

Sudbury, a town of Suffolk, England, on the left bank of the Stour, 16 miles S. of Bury St. Edmunds. It is supposed to have been called Southborough to distinguish it from Norwich. It was one of the first towns in which Edward III. settled Flemings to instruct the English in the woollen manufactures. At the Rebellion it stood out strongly for the Puritans and Great Friars Street Chapel is one of the oldest Free Churches in England. All Saints', St. Gregory's and St. Peter's are all in the Perpendicular style, the first-named exceptionally fine. Other buildings are the town hall, Corn Exchange, St. Leonard's Hospital, Victoria Hall and the Literary and Mechanics' Institution. There are factories for coconut matting, flour mills and malt and lime kilns. Thomas Gainsborough, the famous painter, was born here in 1727. Pop. (1901), 7,109.

Sudd, the tangled mass of papyri, reeds and other plants, decayed vegetation and even trunks of trees which has at times blocked the navigation of the branches of the White Nile. In places it was compressed by the current into blocks of such consistency as to enable elephants to cross from bank to bank. Sir Samuel Baker in 1870 had to cut his way to Gondokoro through fifty miles of Sudd. At his instigation the river was cleared, but within eight years the obstruction had gathered again. Emin Pasha in 1878 was unable to ascend the branch called the Bahr-al-Jebel owing to the accumulation. Once more the river was cleared, but during the years devoted to the suppression of the Mahdi's rising the stream was neglected and in 1895 it was wholly blocked. This time the Sudd was removed more thoroughly and over a longer distance than before and by 1902 the waterway was entirely open. Some of the masses then removed were nearly 20 feet thick and one mile long. By a system of inspection and patrolling the river will be kept permanently free from obstruction.

Sudermann, HERMANN, novelist and dramatist, was born at Matzicken, East Prussia, on September 30th, 1857. He attended school at Elbing and Tilsit and afterwards studied at the universities of Königsberg and Berlin. He began life as a journalist and for a time edited the *Deutsches Reichsblatt*. Although the stories he wrote for the newspapers attracted little attention, he gained such confidence in his powers that at length he decided to devote himself solely to literature. He achieved a success with his novel *Frau Sorge* (1887) and his play *Die Ehre* (1888) created a great sensation. Among his other novels were *Katzensteg* (1889), *Iolanthes Hochzeit* (1892), *Es War* (1894), *Der Sturmeselle Sokrates* (1903) and *The Undying Past* (1906). In his dramas he showed remarkable knowledge of stagecraft from the very first and did not hesitate to attack various problems. His plays included *Sodom's Ende* (1891, forbidden by the Censor), *Heimat* (1893, better known as *Magda*, in which Eleonora Duse made a fine appearance), *Die Schmetterlingsnacht* (1896), *Das Glück im Winkel* (1896), *Moriturus* (1896), *Johannes* (1898), *Die drei Reiterfedern* (1899), *Johannisfeuer* (1900) and *Es Lebe das Leben* (1901).

Sudorifics. [DIAPHORETICS.]

Sudras, the fourth and lowest caste of the Hindu social system. The word, however, has an ethnical value, because the Sudras were the Mongoloid aborigines, who after the Aryan conquest of North India preserved their personal freedom by adopting the Brahminical religion, language, and general culture. They are everywhere now intermingled, especially with the Vaisyas or third Aryan caste.

Sue, MARIE JOSEPH, usually styled EUGENE SUE, novelist, was born in Paris on December 10th, 1804. He at first followed his father's profession of army surgeon, being present in this capacity at the battle of Navarino (1827). Retiring from practice in 1829, through inheriting his father's fortune, he pursued his own bent for novel-writing. He produced a great number of stories, but made an enormous hit by *Les Mystères de Paris* (written for the *Journal des Débats* in 1842) and *Le Juif Errant* (for the *Constitutionnel* in 1844). The Revolution of 1848 enlisted his active sympathies and he was elected to the Assembly as member for Paris (the Seine) in 1850. A vigorous protest against the *coup d'état* was followed by exile to Savoy. He died at Annecy on August 3rd, 1857.

Suetonius (CAIUS SUETONIUS TRANQUILLUS), Roman historian, grammarian, and critic, is supposed to have been born about A.D. 70. He was the son of a military tribune, started in life as an advocate at Rome, and was on intimate terms with the younger Pliny, whose letters to him are extant. Hadrian made him his private secretary (*magister epistolarum*), but he lost the appointment owing to his want of respect for the Empress Sabina. His only important work is the *Vitæ Duodecim Cæsarum* ("Lives of the Twelve Cæsars"), valuable for the anecdotes illustrating the characters of the Emperors.

Suez, a town of Egypt, at the southern end of the Suez Canal, and on the Gulf of Suez, a northern arm of the Red Sea. It is 76 miles E. of Cairo, with which town, as well as with Alexandria, it is connected by railway; and a railway crossing a shallow arm of the Red Sea connects it with Port Ibrahim. Among the chief buildings are the Khedive's kiosque, the Greek church, the hospital, the custom-house, and the Government salt factory. The town's prosperity depends on the traffic in connection with the Canal, which was begun in 1859 and was opened on November 16th, 1869. The Canal cost nearly £20,000,000, is 87 miles in length, and was due to the initiative and energy of Baron Ferdinand de Lesseps. In 1875 the British Government acquired the Khedive's shares for £4,080,000, which gave it a predominant interest in the undertaking. In 1904 there passed through the Canal 4,237 vessels, of a gross tonnage of 18,661,092, the receipts amounting to £4,632,739. More than half of the vessels and two-thirds of the tonnage were British. For the year ending March 31st, 1905, the interest on the British shares amounted to £1,014,304. Pop. of Suez, 24,970.

Suffocation. [ASPHYXIA.]

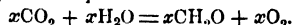
Suffolk, a maritime county of England, having the North Sea on the E., Norfolk on the N., Essex on the S., and Cambridge on the W. It is 50 miles long, with an average length of 30 miles, by 55 miles broad, and an area of 1,487 square miles. Of its rivers, the Stour bounds it on the south, and flows past Sudbury, Nayland, and Harwich to the North Sea; while the Waveney and the Little Ouse form the northern boundary. The Lark flows into the Great Ouse, while the Gipping is continued as the Orwell, and, flowing past Ipswich, unites with the estuary of the Stour. Other streams are the Deben, Alde, and Blythe, which flow eastwards to the sea. The surface is for the most part level, and the soil consists of clay, sand, loam, and fen. The interior from north to south is very fertile, and produces quantities of butter. In the east and west the sandy soil is fertile, with an admixture of loam, while the barren heath lands of the north-west abound with sheep-walks and rabbit-warrens. The loam along the river valleys is extremely fertile, and brings forth barley—much prized by brewers,—wheat, peas, turnips, mangolds, potatoes and beans. The breed of sturdy cart-horses known as Suffolk Punches, and a small variety of black pig, are peculiar to the county. Cattle and sheep are also raised in large numbers. The sea encroaches seriously at certain parts, and Dunwich and Aldeburgh, once important towns, have to a great extent been washed away. There is a trade in corn and malt from the ports; sea-salt is manufactured on the coast; herring and mackerel fishing employ many; Aldeburgh is noted for sprats; and the Orwell has oyster beds. The manufactures comprise agricultural implements, artificial manures, railway plant, gun-cotton, bricks and tiles, cottons, woollens and other textiles, cocoanut mats and rugs, carriages, and gun-flints, besides brewing, malting and shipbuilding. Lowestoft, Southwold, Aldeburgh, Felixstowe and Gorleston are popular seaside resorts. Ipswich is the county town. Suffolk formed part of East Anglia, its inhabitants being the southern folk to the northern folk of Norfolk. In Roman times it was occupied by the Icenii. The English defeated the Dutch under Van Tromp off Lowestoft in 1665 and again under De Ruyter in Southwold Bay in 1672. Pop. (1901), 384,198.

Suffren Saint-Tropes, PIERRE ANDRÉ DE, a distinguished naval officer, was born at the château of Saint Caunat in the department of Bouches-du-Rhône, France, on July 13th, 1726. He entered the navy when a lad and after nearly 40 years' service against the British was, in 1781, placed at the head of a squadron designed to act against them in the East Indies. He engaged in several well-contested but indecisive battles, and captured Trincomalee. In 1784 he returned to Paris, where he died on December 8th, 1788. He was Bailli of the Knights Hospitallers.

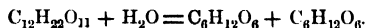
Sufism, the philosophy of the Sufis, Moham-medan mystics (dervishes and fakirs), who hold that all existing things are emanations from the Deity, by whom all human actions are directed, so that there is no real distinction between good and

evil, and no such thing as free will. They hold that the body is the prison of the soul, and that death is an object of desire, since at death the soul returns to the Deity. The system is based on an allegorical interpretation of the poems of Hafiz.

Sugar is formed in plant-cells as one of the earliest products of assimilation. It may possibly originate in the polymerisation of formic aldehyde, according to the equation:—



According to the researches of Brown and Morris, the first sugar to be thus synthesised belongs to the saccharon or cane-sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) group. This acts apparently as a temporary reserve-material in the leaf until it passes a certain degree of concentration, when the more stable starch is formed, the first visible product. The cane-sugar passes into dextrose and lævulose:—



Of these two, dextrose is apparently more quickly used up for respiration, and perhaps also for tissue-forming, so that most of the sugar that passes out of the leaf is lævulose. The starch is translocated as maltose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$). Cane-sugar also occurs undoubtedly as a reserve-material in stems and roots, so that Sachs's summary of observations on the beet, "starch in the leaf, glucose in the petiole, cane-sugar in the root," might perhaps be modified into "cane-sugar, with starch as surplus in the leaf, lævulose in the petiole, and cane-sugar and starch in the axis."

Sugar-Cane (*Saccharum officinarum*), an arborescent grass, probably a native of India, cultivated from time immemorial in China, and probably introduced into Sicily, Crete, Rhodes, and Cyprus by the Saracens, into Spain by the Moors, and into the Canaries, Madeira, Brazil, and the West Indies by the Spaniards and Portuguese. It is now generally grown within 40° on either side of the equator. It has a solid stem of numerous short internodes and flowers in a loose panicle, enveloped in long, woolly hairs and with woolly, violet stigmas.

Sugars. Although originally the term "sugar" was given to all substances which were characterised by a sweet taste, it is now confined to a number of carbohydrates, all of which are closely related in both their chemical and physical properties. They are all obtained as products of animal and vegetable life, and until recent years every attempt to prepare them synthetically had proved abortive. The earliest known was ordinary cane-sugar; afterwards the sweet products derived from beet, maple, sorghum, etc., were recognised as similar; while one by one milk-sugar, grape-sugar, and other varieties were added to the list of these compounds. Chemically they may be divided into two classes—the sacroses, resembling cane-sugar and possessing the formula $\text{C}_{12}\text{H}_{22}\text{O}_{11}$; and the glucoses, of which grape-sugar is a type, to which corresponds the formula $\text{C}_6\text{H}_{12}\text{O}_6$. They are neutral substances, soluble in water, and usually capable of being obtained crystalline. Professor E. Fischer, by whom their artificial syntheses have been effected, has shown that in their chemical nature they are com-

pounds belonging to the class either of ketones or of aldehydes—i.e., possessing the general formula $X \cdot CO \cdot X$ or $X \cdot CHO$, where X is a hydrocarbon radical. Almost all possess the power of acting on polarised light, most of them existing in three varieties, which are respectively dextrorotatory, levorotatory, and inactive. Of the sucroses, cane-sugar is the best-known. There seems evidence that the cultivation of the sugar-cane was first carried on in Eastern Asia, and crude sugar was obtained from the same source in the 7th century by the Chinese. The cultivation spread westwards, and during the Middle Ages Venice was one of its most important seats, while it was further spread west by the agency of the Spanish traders. The sugar-cane (*Saccharum officinarum*), of which many varieties exist, is a great species of grass, the stalks of which reach usually a height of about 12 feet. When ripe, the canes are cut down close to the ground, the leaves and shoots taken off, and the canes immediately crushed by steel rollers. The juices from the crushers are collected in a trough, where they form a yellowish-green, turbid liquid; this is filtered through sieves, and treated with milk of lime in large iron vessels or clarifiers, until a thick scum is formed upon the surface. The underlying clear liquid is drawn off and concentrated in copper pans until sufficiently strong, when it is set aside to crystallise, the portion which still remains liquid being known as molasses. The raw product still requires refining. For this purpose the crude sugar is dissolved in water in large iron tanks, kept well stirred, and heated by steam, after which it is strained through cotton bags and is decolorised by passing through many layers of animal charcoal. It is then concentrated under reduced pressure in large vessels (vacuum pans), and poured into moulds to crystallise completely, the crystals being finally dried in centrifugal machines. Methods essentially similar in most respects are employed for the production of sugar from beet and maple. Pure cane-sugar is a white crystalline compound, which forms crystals of the Monoclinic system. It melts at 160°C. , but decomposes if heated further. Under the influence of dilute acids and of certain ferments it splits up into glucose and levulose, the process being known as inversion. This mixture may then, by the further action of the ferment, undergo some of the numerous forms of fermentation, as that resulting in the formation of alcohol. Milk-sugar, or lactose, which crystallises in Rhombic prisms, and maltose, which results from the action of diastase on starch, as in brewing, both possess the same composition as cane-sugar, and resemble it in most of their chemical properties. Of the glucoses, the best-known are grape-sugar, also known as dextrose or glucose, and fruit-sugar, also known as fructose or levulose. Other varieties of this class are mannose, a derivative of mannite, which occurs in various plant seeds; galactose, obtained from lactose by the action of acids; and sorbinose, which occurs largely in mountain-ash berries. [CARBOHYDRATE; FERMENTATION.]

Suidas, the author of a Greek lexicon, is supposed to have lived at Constantinople in the 10th or

11th century. Besides explanation of words, his work contains articles on matters of historical and geographical interest, with valuable quotations from lost writings.

Sulla, LUCIUS CORNELIUS, Roman general and statesman, was born in 138 B.C. As quæstor under Marius in Africa (107-6), he persuaded Bocchus to surrender Jugurtha, and thus brought the war to a close. He served a second time under Marius against the Cimbri and Teutones (104-1), but even at this early date the jealousy of the popular leader had made Sulla his enemy. In 92 he went to Cilicia as proprætor, and succeeded in reinstating Ariobarzanes on the throne of Cappadocia. After his return he was generally accepted by the aristocratic party as their leader. In the Social War his success was more conspicuous than that of Marius, his greatest triumph being the capture of the Samnite capital, Bovianum. After holding the consulate in 88, he received from the Senate the command against Mithradates, but the tribune Sulpicius stirred up a tumult, and Sulla escaped with difficulty to Nola in Campania. He soon returned at the head of his legion, however—the first Roman to enter the Eternal City at the head of an army,—and Marius was forced to seek refuge in Africa. Early in 87 he crossed over to Greece, captured and sacked Athens (86), defeated Archelaus, the general of Mithradates, at Chieronea (86) and Orchomenos (84), and, advancing across the Hellespont into Asia, negotiated a peace which brought the war to a close. Fimbria, the Marian general in Asia, was easily defeated, and in 83 Sulla again set foot on Italian soil. The Marian cause had triumphed during his absence, but as he advanced his opponent's army melted away, and a victory at Praeneste in 82 threw open the way to Rome. The army raised by the Samnites was vanquished, and a general proscription of Marians was followed by a fearful massacre. Sulla, who had assumed the surname of Felix, now ruled as dictator, and carried out a series of measures by which the aristocratic form of government was completely re-established. In 79 he resigned the consulship and retired to Puteoli, where he gave free reins to his appetite for every form of sensual indulgence, and where he died in the following year.

Sullivan, SIR ARTHUR SEYMOUR, composer, was born in London on May 13th, 1842, and studied at the Royal Academy of Music and the Leipzig Conservatorium. From the date of the production of his charming *Tempest* music at the Crystal Palace in 1862 till his death, which took place in Westminster on November 22nd, 1900, he evinced wonderful versatility and resourcefulness in composition. In the field of oratorios and cantatas he is represented by *The Prodigal Son* (Worcester, 1869), *The Light of the World* (Birmingham, 1873), *The Martyr of Antioch* (Leeds, 1886), and *The Golden Legend* (Leeds, 1886). Of operas and plays there is the unrivalled Savoy series, to the libretto of W. S. Gilbert, comprising *The Sorcerer* (1877), *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1881), *Iolanthe* (1882), *Princess Ida* (1884), *The Mikado* (1885), *Ruddigore*

(1887), *The Yeomen of the Guard* (1888), *The Gondoliers* (1889), *Utopia, Limited* (1893), *The Grand Duke* (1896), and *The Rose of Persia* (1899); the libretto of the last-named was written by Basil Hood. The first four were originally brought out at the Opéra Comique. It is not too much to aver that the collaboration of Gilbert and Sullivan resulted in the very finest examples of dramatic musical composition in the history of English music. His grand opera of *Ivanhoe* was written for the opening of the Royal English Opera House in 1891. Nearly all of Sullivan's songs—about 100 in number—were characterised by remarkable melodic beauty, and some of them, such as "The Lost Chord," attained to extraordinary popularity. He was knighted in 1873, and was buried in St. Paul's Cathedral.

Sully, MAXIMILIEN DE BETHUNE, DUC DE, statesman, was born at the château of Rosny, near Mantes, France, on December 13th, 1560. Prior to 1606, when he received the dukedom, he was known as the Baron de Rosny, a title he inherited from his father. He did good service to the Huguenot cause, distinguishing himself greatly at the battle of Ivry (1590), and, after the accession of Henri of Navarre, became his most trusted minister. By his skill as a financier he averted the bankruptcy which seemed to be overtaking the kingdom. Soon after his master's death he retired from Court, and occupied his leisure in composing his *Mémoires*. He died at Villebon, near Chartres, on December 22nd, 1641.

Sully-Prudhomme, RENÉ FRANÇOIS ARMAND PRUDHOMME, poet, was born in Paris on March 16th, 1839, and was educated at the Lycée Bonaparte. For a time he was employed in the great iron works of Schneider and Company at Creusot and afterwards took to Law. Owing, however, to a continuance of ill-health he practically confined himself to literary composition. He was elected to the Academy in 1881 and in 1901 was awarded the Nobel prize of £8,000 for literature. Such works as *Stances et Poèmes* (1865), *Les Épreuves* (1866), *Les Solitudes* (1869), and others give him a high rank among French poets. His most ambitious efforts were *La Justice* (1878) and *Le Bonheur* (1888). He died in Paris on September 5th, 1907.

Sulphates. [SULPHURIC ACID.]

Sulphides (formerly called sulphurets) are compounds consisting of sulphur united with some other element or radical, and may hence be regarded as derived from the compound SH_2 (sulphuretted hydrogen) by the replacement of the H by other elements. The compounds of sulphur with non-metallic elements—e.g., with chlorine, bromine, etc.,—although very interesting chemically, are not of great commercial or technical importance. The metallic sulphides, however, are of decided importance; many of them exist as natural deposits, and form very valuable ores of the metals. Examples of these are—*galena*, sulphide of lead; *blende*, sulphide of zinc; *copper pyrites*, sulphides of copper and lead; *cinnabar*, sulphide of mercury; *realgar*, sulphide of arsenic; and many others. The metallic sulphides are usually hard

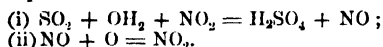
solids insoluble in water, the sulphides of the alkalis and alkaline earths being, however, soluble. Besides their use as ores, many sulphides find other applications. Thus, pyrites are largely used as a source of sulphur or in the preparation of sulphuric acid; cinnabar is extensively used as a pigment. Most of the sulphides may be prepared artificially as white or coloured precipitates by passing sulphuretted hydrogen into acid or alkaline solutions of metallic salts. Organic sulphides are also well known, the whole class of compounds known as mercaptans being completely analogous to the metallic sulphides, while carbon disulphide (CS_2) is a most important and technically useful liquid.

Sulphonal is a compound represented chemically by the formula $\text{C}_7\text{H}_{10}\text{S}_2\text{O}_4$, which may be obtained by rather complicated chemical processes. It is a colourless substance which crystallises in bright flakes which melt about 125° . It is said to produce refreshing sleep without interfering with digestion; its action is, however, somewhat uncertain, and it sometimes produces giddiness and skin eruptions.

Sulphur occurs native most frequently in volcanic regions; or in thick beds associated with gypsum and celestine, as in Sicily; or as a deposition from geysers; or as a sublimate in volcanic craters, as at Kilauea. It crystallises in the Prismatic system in sulphur-yellow, translucent crystals, with resinous lustre, a hardness of 1.5 to 2.5, and a specific gravity of 2. Though much sulphur in commerce is obtained by roasting pyrites, native sulphur is the source of a considerable proportion of that which we use. In medicine sulphur has been largely employed in the form of unguentum sulphuris in the treatment of certain skin diseases, and particularly with a view to destroying the parasite of scabies (itch). The confection of sulphur of the British Pharmacopœia is a mild laxative, and is often given to promote the action of the skin and to regulate the bowels in persons who suffer from chronic skin disease. Sulphur has also been largely used in the treatment of chronic rheumatism.

Sulphuric Acid. Of all the acids which find employment in the various industries of the United Kingdom this compound is by far the most important, being, directly or indirectly, useful in almost every industrial process. It appears to have been known in the alchemistic period, and was then prepared by heating coppers. Its manufacture by heating sulphur and nitre was carried on in the 17th century. The first sulphuric acid works were established at Battersea in 1772, and the erection of other similar works was soon followed by various improvements in the methods of its production. The present method of carrying out the process is as follows:—By heating pyrites in suitable kilns or furnaces sulphur dioxide is formed, which passes with the excess of air into a large lead chamber, into which pass also jets of steam and nitric acid fumes produced by the action of sulphuric acid upon Chile saltpetre. Here by the interaction of these compounds sulphuric acid is formed, and collects at the bottom of the chamber. The nitric

fumes get reduced to lower oxides, but are again oxidised by the air present also. The remaining gases pass into a second chamber and again meet steam jets, more acid being deposited, and are then drawn into a third chamber, where a similar effect is produced. The remains of the gases, now almost solely nitric fumes, and air are drawn up a chimney—the "Gay Lussac tower"—in which they meet a descending spray of strong sulphuric acid, which absorbs the nitric fumes, this nitrated acid afterwards giving up the fumes to the sulphur dioxide in the "Glover's tower" before the gas enters the lead chambers. The sulphuric acid is drawn off from the chambers, and then contains about 64 per cent. pure acid. It is concentrated first in leaden pans, and finally in glass or platinum vessels. The manufacturing process depends on the power of nitric oxides to oxidise sulphur dioxide and of the nitrous oxides to absorb oxygen, and so make the process continuous. The following equations represent these reactions :—



The pure acid has the composition H_2SO_4 , and is a thick, colourless, oily liquid, known also as oil of vitriol. If mixed with water, much heat is evolved, the mixture being attended by a contraction in volume. Owing to the readiness with which it absorbs water, it forms an admirable desiccator for gases, etc. It is a powerful acid forming a series of salts known as sulphates. If both hydrogen atoms are replaced by metals, normal sulphates result, acid sulphates being salts in which only one hydrogen is so replaced. The uses of the acid, both in pure chemistry and in technical and industrial processes, are manifold and varied, whilst many of its salts also are important commercially. Thus ferrous sulphate, or copperas, is largely employed in chemistry, in dyeing, and in the manufacture of inks; copper sulphate or blue vitriol is used in electroplating, as an insecticide for phylloxera, in dyeing, etc.; calcium sulphate is well known under the name of gypsum, zinc sulphate as white vitriol, while the sulphates of sodium, potassium, and ammonium are valuable compounds. The numerous compounds known as alums are also all double sulphates—i.e., the sulphuric acid radical united with two different metals.

Sumac, or **SUMACH**, the general name for various species of the genus *Rhus* belonging to the Terebinthaceæ, a genus which includes also the Japan lacquer-tree. Most of the species are shrubs with pinnate leaves, small, generally unisexual flowers, and small drupaceous fruits. *R. venenata*, the poison-elder, and *R. Toxicodendron* are poisonous American species. *R. Coriaria*, a native of the Mediterranean area, is the tanning sumach, the leaves of which form the commercial sumach, used in tanning and dyeing; and *R. Cotinus*, of the same district, is the Venetian Sumach or Wig-tree of gardens, the branches of which are the yellow dyewood known as young fustic. It gets its name of wig-tree from the remarkable red-branched plume formed of barren pedicels.

Sumatra, an island of the Indian Ocean, upon the Equator, separated from the Malay Peninsula by the Strait of Malacca, and extending in a north-westerly and south-easterly direction. It is the next largest to Borneo of the Asiatic isles, and is 1,050 miles long by 240 broad, and contains 161,612 square miles. The eastern side is level, but the western mountainous, there being two or three ridges almost parallel with the coast. The average height of these is in the south from 2,000 to 3,000 feet, while in the north they rise to 5,000 feet, receding from the shore still farther north, and declining into hills. The highest peak is Indrapura (12,000). There are some volcanoes in the island. Of the rivers, those on the west are short mountain torrents, but those on the east are long and end in deltas. The chief of these are the Palembang, Jambi, and Indragiri. There are several lakes, the largest being Sinkara and Tobia. The temperature of the island is equable, but the south is visited by heavy and almost continual rain. The geological formation of the island is trachyte, syenite, granite, porphyry, red sandstone, limestone, and some basalt; excellent coal is found, and the metals include gold, lead, iron, tin, and copper. Vegetable life is varied and abundant. The forests are so dense that it is said an ape might traverse the island from north to south without touching ground. Among the trees are mangroves on the coast, palms, oaks—at a height of from 900 to 6,000 feet above sea-level—the upas-tree, camphor-tree, Rafflesia, etc. A Dutch expedition in 1877 is said to have collected 400 varieties of useful timber. There are all kinds of gaudy flowers and tropical fruits, especially the mangosteen and durian. Tobacco and black pepper are the most valuable products. Animal life is equally luxuriant: 120 species of mammals, 270 species of birds, and 40 different kinds of snake, including the python and boa, have been observed, and there are many varieties of beetles and butterflies. Among the larger animals are the rhinoceros, elephant, tiger, and orang-utan. The domestic animals are chiefly the pig, cow, a small breed of horse, and the buffalo. The Dutch possess much of the island, and exercise a kind of protectorate generally. They make six divisions of their possessions—(1) West Coast (31,649 square miles), capital Padang; (2) Benkulen (9,399), capital Benkulen; (3) Lampongs (11,284); (4) Palembang (53,497), capital Palembang; (5) East Coast (35,312); and Atjeh or Achin (20,471). Sumatra was visited first by the Portuguese in 1508 and the Dutch established themselves in the 17th century. The British who had set up a station at Benkulen ceded it to the Dutch in 1824. The Dutch reduction of the island was a laborious process and it may be doubted whether the Achinese are even yet thoroughly subjugated. The population of the island is very mixed. There are Malays, Chinese, Arabs, Hindus, Orang Kubu, who are savages, and the Menangkubu, who are pure Malay. But the most curious native race are the Battah. They are short and sturdy, and closely resemble the Caucasian type. They have known writing from time immemorial, but they have the peculiarity of starting from the left and writing vertically

upwards in successive lines. Their one vice appears to be cannibalism. The natives live in independent village communities, and have neither temple nor priest. Pop. (1900), 3,168,312.

Sumner, CHARLES, statesman, was born at Boston, Massachusetts, United States, on January 6th, 1811. He studied at Harvard and was called to the bar in 1834. After a three years' visit to Europe he settled in Boston, and in 1845 produced a deep impression by his strong plea for peace and indictment of war in his speech on *The True Grandeur of Nations*. He helped to found the Free Soil Party (1848), and in 1851 was elected to the Senate, where his powerful speeches on the anti-slavery side excited so much animosity that he was brutally attacked (1856) by Preston Brooks, a Senator for South Carolina, receiving injuries which disabled him for three years. He was re-elected in 1859, and in 1860 delivered his speech, *The Barbarism of Slavery*, occasioned by the claim of Kansas to be admitted as a free state. From 1861 to 1871 he was chairman of the committee on foreign affairs in the Senate. He died at Washington on March 11th, 1874.

Sumter, Fort, so called after a Revolutionary general, is situated on a shoal in Charleston Harbour, United States, 3 miles S.E. of Charleston. When, in 1860, South Carolina seceded, Major Anderson, the commandant, made a determined stand for the Union, with 80 men and 62 guns. General Beauregard attacked it on April 12th, 1861, however, and it surrendered two days later, the event marking the initial step in the Civil War. The Confederates at once strengthened the works, but the fort was not seriously endangered until April, 1863, when it held its own against an assault delivered by monitors. In the following July, however, it was bombarded from Morris Island and silenced in a week. The garrison, nevertheless, held on and defeated a sea attack in September. In the autumn it was bombarded for 40 days, and again in the following summer, but it was not till April, 1865, that the Federal flag was once more flown from the fort.

Sun, the centre of the system of bodies consisting of the planets and their attendant satellites. To them he radiates light and heat; he regulates their movements and controls their distances from himself. But he was not always regarded as the centre of this system. It was true that his apparent motions were the cause of day and night, and gave the variations in the seasons, but these apparent motions were regarded in early times as actual. It was natural that so obviously important a body should receive attention, and so we find that the Egyptians as well as the Chaldees recorded their observations on his movements and eclipses. After Nicholas Copernicus (*De Revolutionibus Orbium*, printed in 1543) had asserted that the Sun, and not the Earth, was the centre of our system, and that the Earth and other planets moved round him, it began to enter into men's minds to consider him in different ways and to attempt to discover the cause of his power and the mysteries of his constitution. One of the most obvious problems to solve was to find

his distance from the Earth, and this could only be done by making use of measurements concerned with other planets besides the Earth. This problem of finding the Sun's distance is of immense importance, but, owing to its extreme difficulty, it is not quite settled even now. This distance—the radius of the Earth's orbit—is the unit of length of the universe; distances of the stars are measured in

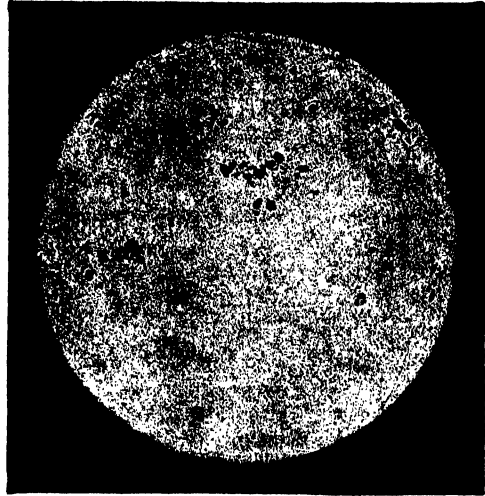


FIG. 1.—THE SUN.

terms of it, and any error in its computation will give rise to multiplied errors throughout the whole range of astronomy. The problem, stated in its simplest form, is to find what angle is subtended at the Sun by the Earth's semi-diameter; and, if it were not for the presence of our own atmosphere, this could be found out by direct measurements on the Sun when he is on the horizon, but the disturbing effects of the atmosphere make such a solution impossible. Indirect means had, therefore, to be devised for obtaining the value of this angle or horizontal parallax. [PARALLAX.] Aristarchus, who flourished in the 3rd century B.C., had attempted to compare the distances of the Earth from both Sun and Moon, but his method was naturally imperfect. Relative distances of the different planets from the Sun have, however, been known since the time of Johann Kepler (1571-1630) [KEPLER'S LAWS], so that only one absolute measurement was necessary in order to know all the others, provided that that measurement could be relied upon. In 1672 Jean Richer at Cayenne and Jean Dominique Cassini at Paris, from observations on the opposition of Mars, estimated the Sun's distance to be about 87,000,000 miles. John Flamsteed (1646-1719) gave it as 81,700,000 miles, and the Abbé Picard (1620-82) as 41,000,000. The differences were truly enormous. The transits of Venus were now hailed as a means of solving the problem. At the rare times when Venus partially eclipses the Sun, the planet appears as a dark

spot on the Sun's disc, and it is only necessary exactly to determine, on the one hand, the moment when she enters the brightness or leaves it, or, on the other, the time she takes to complete the passage. Unfortunately for this, these transits are rare; two take place within about eight years, and then there

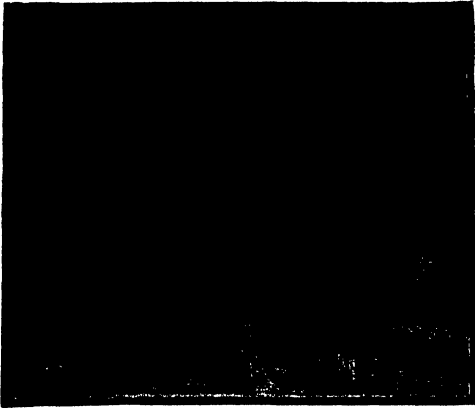


FIG. 2.—PROMINENCES ON THE SUN.

is a gap of over a century. The transits observed in 1761 and 1769 were found to give the most discordant results, until Johann Franz Encke, in 1824, published the result of his interpretations of the different observations. He gave 95,250,000 miles as the probable value, and this was gladly accepted till doubts were published by Peter Andreas Hansen in 1854 and re-echoed by other observers. An opposition of Mars in 1862 reduced the value to about 91,000,000, and supported the views of the doubters. Again Hippolyte Louis Fizeau and Léon Foucault had succeeded in measuring the velocity of light by means of measurements on the Earth only, and in the same year (1862), by using this velocity, Foucault, too, came to the conclusion that the Sun was nearer than Encke had deduced. Astronomers looked forward to the coming transit of Venus of 1876 with confidence, believing that this would settle all doubt. Edmund Halley's method, published in 1706, was improved, and the difficulties of Joseph Nicolas Delisle's (of 1760) were found to be greatly decreased owing to modern methods of fixing longitudes; to these two methods photography was added, and the world was breathless with expectation as the time of transit drew near. Then it was found that from the eighty different improvised observatories conflicting statements poured in. A new difficulty arose: the atmosphere of Venus introduced the effects of refraction, and the bewildered observer was unable to say when the transit actually began or ended. The transit of 1882 left the uncertainty still nearly 2,000,000 miles. In 1877 Dr. (afterwards Sir David) Gill obtained a good result from an opposition of Mars, and later (in 1888) observed the minor planet *Iris*, following this work with similar observations

on Victoria in 1889. From his work the value 92,700,000 miles is accepted as having the smallest probable error, an error regarded as less than 200,000 miles.

If evidence on the Sun's distance shows great laxity in agreement, much more disagreement has prevailed as to the estimate of the Sun's temperature. Sir Isaac Newton first investigated the amount of heat received by the Earth, and many have followed his lead. Claude Servais Mathias Pouillet (1791-1868) discovered that the vertical rays of the Sun bestow upon every square centimetre 1.7 gram degree Centigrade units of heat per minute. Then laws were suggested, connecting this measurable quantity with the temperature of the Sun, allowance being made for absorption of heat by the atmosphere. But laws which answered for moderate temperatures were shown to fail at high ones, and measurements of a different kind were introduced. It was found that the Sun's own atmosphere absorbed a considerable amount of his radiation, and Frost in 1891 showed that this absorption was about seven-seventenths of the whole. Samuel Pierpont Langley (1834-1906) in 1880 began to measure the intensity of different rays in the spectrum by means of their effect on the electrical conductivity of platinum, and after untiring research he was led to raise Pouillet's constant from 1.7 to 3 gram degrees as the value of the Sun's heat unaffected by our atmosphere. Of this, however, hardly 60 per cent. reaches the Earth's surface. Deductions as to the actual temperature of the Sun are not trustworthy, as we do not know how matter behaves in the unknown

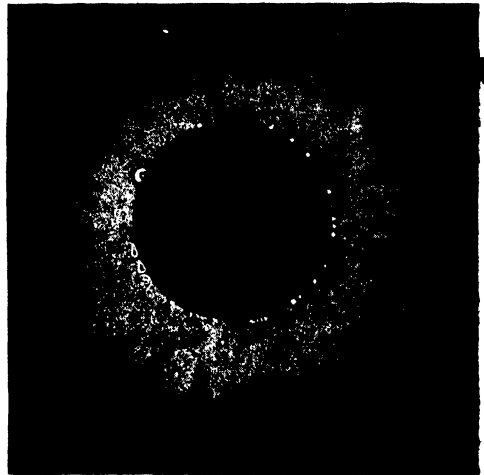


FIG. 3.—SOLAR CORONA, MAY, 1882.

condition in which it exists in the Sun. Viole in 1876 suggested 1,500° to 2,500° C. as the possible limits, but in 1881 raised the value to 3,000° C., while in 1892 Le Chatelier gave it as 7,600°.

Observations during eclipses, enormously helped since 1860 by the use of photography, have taught us

much about the Sun's surface. The spectroscope has in the hands of many observers disclosed the presence of iron, nickel, magnesium, sodium, and, in fact, nearly all the known metals in the form of vapour upon the solar surface. Above these rise the vast jets of flame or prominences (Fig. 2), which are again succeeded by the corona. Beneath the metallic vapours comes the photosphere, the limit of the solar disc. Beginning at the outside, the corona (Fig. 3) may be said to be a solar appendage, but not a solar atmosphere. It has been seen to reach a distance from the Sun equal to twelve times his own diameter. It does not seem to be affected by gravitation to the Sun. There is no increase of density nearer the luminary; neither does it rotate with the Sun. It consists of gaseous matter, among which is hydrogen and an unknown substance called "coronium," while particles in the solid or liquid state are also present. It is continually in a state of motion to and from the Sun, but the constituent atoms must be so far apart as to represent what we should regard as a high vacuum. Comets pass through it with unaffected velocity. The average appearance of the photosphere (Fig. 1) is that of a heap of sand or shot spotted over with points of blackness, but spread over this are bands and spots of less granular appearance. The more granular part has been described as the "willow-leaf" structure (see Fig. on next page), and is probably due to the difference in brightness of rapidly ascending and descending currents of vapour. The uniformity of the photosphere is so interrupted, especially in certain belts, by what are known as sun spots. Near these are often to be seen white raised tracts called faculae, regions giving evidence of great pressure. The chromosphere is a vaporous layer completely enveloping the photosphere, and consisting of hydrogen and an unknown element, "helium." It is several thousand miles thick, but varies from time to time. It has been an object of much beauty and interest during eclipses, when it is seen to be of a reddish tint with an irregular edge. While the true atmosphere constantly sends flashes of vapour (containing iron, magnesium, etc.) into it from below, it, on the other hand, shoots up into enormous prominences like clouds and flames, of which the cloud-like ones are more permanent. Although these protuberances were first noted only during eclipses, since 1869 they have been observed constantly by means of a special arrangement of the slit of the spectroscope which was suggested simultaneously by Sir Joseph Norman Lockyer and Pierre Jules César Janssen. The corona, however, has as yet only been studied during eclipses, and its constitution is an unsettled question, although the existence of rapidly-dispersing clouds of hydrogen above the prominences has led to the belief that the corona, too, may consist of the same gas highly rarefied and accompanied by more helium, the illumination being caused by magnetism. The combined spectroscope and photographic appliances have done good work in this branch of astronomy, and Professor Hale has succeeded in photographing faculae, spots, prominences, chromosphere—in fact, all the phenomena of the solar surface.

Sun-Bear (*Ursus malayanus*), from the islands of the Malay Archipelago. The length is somewhat less than 5 feet, and the fur smooth and black and there is a white patch on its breast, in some almost like a ruff round the neck. The tongue is extensible and very useful in robbing bees' nests of the honey, of which the animal is very fond. These bears are easily tamed and become amusing. They have the habit occasionally of walking on their hind legs.

Sunbird, a bird belonging to the Passerine family Nectariniidae, with several genera, chiefly from Africa, the south of Asia, and Australia. They are small birds, of very brilliant plumage, feeding chiefly on insects, but also on fruit and on the nectar of flowers, sipping the latter with their long bills.

Sunda Isles, the general name of a group in the Indian Archipelago, divided into Greater and Lesser. The Greater include Borneo, Sumatra, Java, Celebes, Madura, Banks, and Billiton; and the Lesser include Bali, Lombok, Sumbawa, Sumba (or Sandalwood), and a few others, together with the Timor Islands. Saving certain areas in Borneo, they belong to or are under the jurisdiction of the Netherlands.

Sunday Schools, founded by Robert Raikes, of Gloucester, in 1781, for instructing and influencing children and young people on Sunday. The credit belongs to Raikes only in a very general sense. The Rev. Thomas Stock, a curate of Ashbury in Berkshire, was a contemporary and independent promoter and the somewhat obvious idea of teaching on Sunday had occurred to others before their time. The teaching is becoming exclusively religious (as has always been the case in the Scottish Sabbath schools) to keep step, as it were, with the spread of secular education. In America Sunday schools were instituted in 1816.

Sunderland, a seaport of Durham, England, situated at the mouth of the Wear, 12 miles N.E. of Durham and 11 S.E. of Newcastle. Upon the southern bank of the river are Sunderland proper, with Bishopwearmouth to the west, and on the northern bank is Monkswearmouth. The old parish church of St. Peter is in Monkswearmouth, and occupies the site of the monastery where lived the Venerable Bede. Among the buildings are the Town Hall, Museum, Art Gallery, Free Library, and other public institutions. There is a fine park at Roker besides other open spaces. Two piers with lighthouses form the entrance of the harbour, and a harbour of refuge has been constructed by two other piers. The docks and basin occupy 78 acres, the principal one being on the south, and having openings to both river and sea. The export of coal is very great, and over two millions of tonnage pass out annually. In addition to the traffic connected with the docks and harbour, shipbuilding and ironfounding are carried on, and other industries are the making of glass bottles, sheet- and plate-glass, earthenware, chemicals, machinery, chains and anchors. Much lime is burnt, and there is a large fish trade. Pop. (1901), 146,077.

Sunderland, ROBERT SPENCER, 2ND EARL OF, statesman, was born in Paris in 1640 and educated partly by his mother (Dorothy Spencer, "Sacharissa"), partly by tutors, and partly at Christ Church, Oxford. He soon developed into a consummate political intriguer, unmatched even in his own day for duplicity and restless ambition. Although he had supported the Exclusion Bill, he attached himself to James II. on his accession and became Lord President and principal Secretary of State, conforming outwardly to the Catholic religion and sharing the king's most secret counsels. Yet at this very time he was in correspondence with William of Orange, and, although he was not included in the Act of Indemnity, he was able to present his conduct in such a favourable light that he gained the king's complete confidence and eventually became Lord Chamberlain (1697). He died at his place at Althorp, Northamptonshire, on September 28th, 1702. His son, CHARLES SPENCER, was born in 1674 and strengthened his position among the Whigs by a marriage with the Duke of Marlborough's daughter, and was Secretary of State from 1706 to 1710. His intrigues against Townshend and Sir Robert Walpole were crowned with success in 1717, when he again became Secretary of State. In 1718 he was made First Lord of the Treasury and Prime Minister, and Walpole and Townshend, finding opposition useless, entered into a coalition with him. The South Sea Bubble brought about his fall, and at the time of his death, on January 31st, 1722, he is said (on very indifferent evidence) to have been in correspondence with the Pretender.

Sundew, the popular name for the species of the large genus *Drosera*, the typical genus of the order *Droseraceae*. There are three British species. They have small fibrous roots; rosettes of reddish radical leaves covered with "tentacles," or lobes ending in glands, each of which secretes a glistening dewlike drop of liquid; and a scorioid, or apparently circinate, inflorescence of minute white flowers, which are generally cleistogamous. The sundews are all carnivorous plants, *D. rotundifolia* having been more thoroughly investigated than any other of these plants. All three British species grow in bogs and moist heaths.

Sundial. [DIALS.]

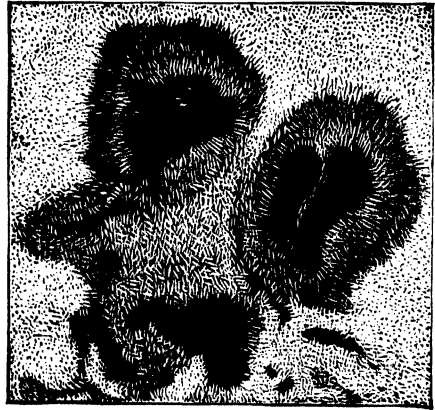
Sunfish, a fish belonging to the genus *Orthogoriscus*, of the Globe-fish family, with two species widely distributed in tropical and temperate seas. The body is compressed and very short, but cannot be inflated with air. The Short Sunfish (*O. mola*) attains a length of 7 or 8 feet, and is often taken on the southern coast of England and on the coast of Ireland, as it basks on the surface. The Oblong Sunfish (*O. truncatus*) occurs less frequently.

Sunflower (*Helianthus annuus*), a magnificent Composite, said to be a native of Mexico and Peru, and introduced into England, like its congener the Jerusalem artichoke, about the end of the 16th century. It has large coarse leaves and flower-heads a foot or more in diameter, which are great favourites with bees. It does not ripen its fruits

so regularly in Great Britain as in Hungary and Central Russia, where it is largely cultivated. The leaves form a green fodder; the stems can be burnt for fuel or for potash, in which they are rich; and the fruits can be roasted and used for coffee, ground into meal for tea-cakes, eaten as nuts, used for poultry, pigs, and even cattle, being superior to linseed; or crushed, as they are in Russia, for oil, of which they yield 16 to 26 per cent. The oil is used for salad-oil, soap-making, and painting, and the residual cake as cattle-food.

Sunnites. [SHIAISM.]

Sun Spots are dark regions, of great activity, occurring in the photosphere of the sun, and undergoing periodic alterations, the periods differing with different spots, but having a mean of about



SUN SPOT, SHOWING "WILLOW-LEAF" STRUCTURE.

11 years. These spots are of great interest on account of their agreement in time with certain magnetic phenomena on the Earth; the one grows greater or less as the other increases or diminishes. A typical sun spot consists of a black nucleus surrounded by a dark umbra, this in turn being bounded by a lighter penumbra, which seems of a lighter character and often sends out arms across the intervening umbra. Probably the spot is only carrying out the general movements of vapour in the photosphere, only on a much larger scale. Huge masses of vapour force their way downwards, carving a passage for themselves, and appear dark by absorbing the light from the hotter interior. So great are the disturbances in these spots, due to enormous variations in temperature and pressure, that they may be considered as capable of communicating their unsettled state to the Earth's magnetic condition. Spectrum analysis confirms the fact that great pressures occur in these spots, enormous widening of certain lines being often found, while lines displaced from their natural position in the spectrum show violent upward velocities of vapour.

Sunstroke (*Insolatio*). As a result of prolonged exposure to heat, commonly from the direct

rays of the sun, an attack of unconsciousness has been known to supervene, usually attended with stertorous breathing, small frequent pulse, and great heat of the surface. The attack is sometimes quite sudden, but is generally preceded by giddiness, nausea, a sense of prostration, and other premonitory symptoms. Recovery is ordinarily slow, and a fatal issue by no means rare. The most effectual treatment consists in the application of cold to the head. Counter-irritants and stimulants are occasionally employed.

Sun Worship, a form of Nature worship which in the earliest ages seems to have been more widely diffused among peoples who had risen from the condition of hunters to that of tillers of the soil, probably for the reason that the sun's influence would be more beneficial to the agriculturist than to the hunter. From the East it passed to Greece and Rome. It is frequently denounced in the Old Testament, yet from it the prophets of the Old Law borrowed much striking imagery.

Sunn Hemp, the fibre from the liber-layer of the stem of *Crotalaria juncea*, a shrubby leguminous plant, eight to twelve feet high, extensively cultivated in India. *Crotalaria* is a large genus, with racemes of yellow papilionaceous flowers with a two-lipped calyx, heart-shaped standard petal, monadelphous stamens, and curved oblong, inflated legume. *C. juncea* branches and bears silky simple leaves. The fibre is not so soft as jute, and is chiefly used for cordage and canvas.

Superior, LAKE, the largest sheet of fresh-water in the world, is the most westerly and most northerly of the chain of great American lakes, and lies partly in the United States and partly in Canada. Of a somewhat irregular crescent shape, it is bounded on the N. and N.E. by Ontario, on the S. by Michigan and Wisconsin, and on the W. by Minnesota. It is 420 miles long by 160 miles broad, contains 31,000 square miles, has 1,750 miles of shore-line, and a depth of 79 fathoms. The northern shore is bold and precipitous, with cliffs from 300 to 1,500 feet high; the southern is sandy and low, except here and there, where are limestone ridges. One of these, the Pictured Rocks, forms a perpendicular cliff, 300 feet high. In the south and north are islands, the larger to the north affording good shelter and harbourage, while those to the south are smaller and without harbours. Isle Royale, the largest, belongs to the United States. The lake receives about 200 streams, and has an outlet to the east by the Sault Ste. Marie. Rapids prevent navigation on this river, but the difficulty is avoided by canals, by means of which communication with the Atlantic is established. The lake is liable to storms of great violence. The waters are transparent and there is good fishing, especially of trout and sturgeon. Copper abounds on the shores and islands.

Suppé, FRANZ VON, composer, whose baptismal name was Francesco Ezechiele Ermenegildo Cavaliere Suppé-Demelli, was born at Spalata in Dalmatia, or on board ship near by, on April 18th, 1820. He was sent to the University of Padua to study

philosophy, but his talent for music asserting itself, on his father's death his mother settled in Vienna and he entered the Conservatoire. He became the gratuitous conductor of the Josephstadt Theatre and afterwards obtained an engagement at Pressburg. Being appointed leader of the orchestra of the Theater an der Wien, where his duties included musical adaptations and elaboration, by his independent compositions he came to be recognised as one of the most prolific and most successful Viennese musicians, often being called the German Offenbach. Besides his popular overture *Dichter und Bauer*, only two of his operas are known in England.—*Fatinitza*, produced in Vienna in 1876, and at the Alhambra in London on June 20th, 1878, the most successful, and *Bacchis*, brought out in Vienna in 1879, and at the Comedy Theatre, London, on April 22nd, 1882. Von Suppé, who also wrote church music, died on May 20th, 1895.

Supple-jack, an American name for various climbing and twining shrubs, especially the tendrill-bearing species of *Paullinia* and *Cardiospermum*, belonging to the order Sapindaceæ, in tropical America, and the twining *Berchemia volubilis*, belonging to the Rhamnaceæ, in Virginia.

Suppuration. [INFLAMMATION; PUS.]

Supra-renal Capsules, or ADRENAL BODIES, are two flattened glandular masses which lie on either side of the abdomen, resting on the upper border of the two kidneys; each capsule consists of a cortical and of a medullary portion. The function of these bodies is not understood, but they have been found in numbers of instances to be affected by degeneration in the malady known as Addison's disease, in which bronzing of the skin is associated with wasting and other symptoms.

Surat, a town of the Presidency of Bombay, India, on the left bank of the Tapti, 14 miles from its mouth. It extends for $1\frac{1}{2}$ mile along the river, and has in the centre a fortified castle, now occupied by public offices. A curious feature of some of the houses is that they have half-timbered projecting upper storeys. The suburbs are large and open. To the west of the town are the military cantonments. There are some fine mosques, Mahommedan tombs, Hindu and Parsee temples, churches, a clock-tower and a high school. The silted-up harbour and the rivalry of Bombay have deposed Surat from its former important position. It has manufactures of cotton, silks and embroidery. Pop. (1901), 119,306.

Surd. If the root of an algebraical expression cannot be expressed in finite terms, that root is called a surd. The sign $\sqrt{}$ is prefixed to any expression to denote its square root. $\sqrt[3]{}$ means the cube root, $\sqrt[5]{}$ the fifth root, and so on, the numbers 3, 5, etc., being called the indices of the surd. Since we cannot find a definite value for the square root of 8, $\sqrt{8}$ is a surd or an irrational number; similarly, $\sqrt{a^2}$, $\sqrt{a + bx}$, $\sqrt[4]{a^2 + x^2}$ are surds or irrational expressions. It is not always possible to tell by inspection whether an expression is

irrational or not, and certain rules can then be applied for its identification. Surds are either real or imaginary; if the index of the surd be an even number, and the number under the root be negative, we have an imaginary surd. Thus, $\sqrt{-a}$, $\sqrt[4]{-8}$, are imaginary, for no conceivable number raised to an even power can give a negative result. Although definite values cannot be given to them, they can be used in exactly the same way as any other algebraical symbols. Surds are often written without the root sign, fractional indices being used instead. Thus, \sqrt{a} may be written $a^{\frac{1}{2}}$; $\sqrt[3]{a^3}$ may be written a^1 . \sqrt{a} or $a^{\frac{1}{2}}$ is known as a simple quadric surd, while $\sqrt{a} + \sqrt{b}$ and $x + y^{\frac{1}{2}}$ are known as binomial quadric surds; they are expressions containing two terms, one or both of which are simple quadric surds. If two binomial quadric surds differ only in the sign connecting the term, they are said to be conjugate, and their product is the difference of the squares of the respective terms. Thus, $\sqrt{x} + \sqrt{y}$ and $\sqrt{x} - \sqrt{y}$ are conjugate, $x - y$ being their product. All the laws of indices are obeyed by surds as well as by rational expressions. [INDICES.]

Surface Tension. If we try to mix oil and water on a plate, we shall find that they will separate directly they are left alone. The two liquids have therefore done work in order to separate, and have lowered their energy; the tendency was to decrease the surface between them as much as possible. Hence decrease of energy and decrease of surface take place together, or, looking at it from the other point of view, the greater number of particles existing in the surface the greater is the energy of the liquid; so that we may draw the conclusion that a particle of liquid has more energy when in the surface than when far from it. This energy is known as surface energy, and is proportional to the area of the fluid surface. The energy of the two surfaces of a soap-bubble is equal to the work done in blowing the bubble, but it is usually stated in the form of the energy per unit area. Surface energy is not always the same for any fluid, but depends on the other substance which meets it at that surface. With the same two non-mixable fluids, however, the surface energy is a fixed quantity. The surface of a fluid is exerting a tension in all directions, and it is the action of this force which causes the contraction of the surface and the lowering of the energy of the fluid. It is usual to consider this force as acting across a line of film and to express it as the force per unit length. It can then be shown that this force per unit length, or surface tension, is equal to the energy per unit area, and the surface tension also depends upon the nature of the two fluids bounded by the surface. When three fluids can exist in contact with each other, the surface tensions for each pair are three forces in equilibrium, and their values determine the angles between the three surfaces. The same three

fluids always meet at the same angles. If the surface tension between two is greater than the sum of the surface tensions between the other two, there cannot be equilibrium. This is the case when air, water, and oil are the three fluids; the surface tension of water in contact with air is so much greater than the sum of the tensions between air and oil, and between oil and water, that the oil is pulled out. It tries, in fact, to cause the last two surface tensions to act in one line, so that their resultant shall be as great as possible, and thus tends to make the surface between water and air and that between oil and air lie in one plane. This occurs when the angle between oil and water is reduced to zero—i.e., when the oil is drawn out into an infinitely thin film. Surface tension also acts when a fluid is in contact with a solid. A liquid in a fine capillary tube is in contact with the solid tube and with the air, and as long as the surface tensions between pairs of the three substances are in equilibrium, the surface of the liquid will make a definite angle with the tube. [CAPILLARITY.]

Surgeons, ROYAL COLLEGE OF, in London, was established in 1800. Its membership is essential to the practice of surgery within the metropolitan area, and many medical men possess what is known as the double qualification—the M.R.C.S. and the L.R.C.P. (Licentiate of the Royal College of Physicians). The College is not a teaching body and affords no opportunity for clinical practice, but it is the recognised examining authority and has chairs and lectureships in anatomy, surgery, physiology and certain other cognate subjects. The collection formed by John Hunter was acquired through a Parliamentary grant of £15,000 and presented to the College in 1800 and constitutes the museum of the building in Lincoln's Inn Fields. A Hunterian Orator is elected every other year, an appointment usually bestowed upon an eminent surgeon. The College has power to elect to their Fellowship, in some instances without examination. The Royal College of Surgeons of Edinburgh, whose first charter (conferred by the Town Council) dates from 1505, grants diplomas of Fellow and Member. In 1778 it received from George III. its royal charter of incorporation. Its Hall is in Nicolson Street. The Royal College of Surgeons of Ireland was incorporated in 1786.

Surgery. The art of surgery had already attained a high degree of development in many countries some centuries before the Christian era, as is evidenced by Sanscrit manuscripts and the works of Hippocrates, and to a less notable extent by Egyptian and Chinese writings. The Hindus and Greeks were familiar with, and described, most of the forms of fracture and dislocation which are recognised at the present day. The operations of laparotomy and lithotomy were occasionally performed by them; aneurysm and the forms of hernia were recognised. The want of knowledge of anatomy, due to the fact that systematic dissection was not practised, and the absence of satisfactory methods of dealing with bleeding vessels, considerably limited, however, the scope of the operator in ancient times. A compendium of the surgical

knowledge which grew up in the course of succeeding centuries is furnished in that part of the work produced by Paulus of Ægina which deals with surgery. This book was written in the 7th Christian century and for some centuries after its appearance but little further progress resulted. The more remarkable additions to surgical practice date from a comparatively recent period. The growth of knowledge with respect to anatomy and physiology in the 17th and 18th centuries led to a great advance being made, the names of Richard Wiseman (?1622-76) and of John Hunter (1728-93) being especially noteworthy among those who contributed in Great Britain to this advance. In the 19th century the introduction of anaesthetics by Sir James Young Simpson (1811-70) revolutionised surgical practice, and acceptance of the germ theory of disease and development of the antiseptic treatment of wounds, with which the name of Lord Lister (b. 1827) is associated, have worked remarkable changes in the scope and results of operative treatment.

Surinam. [GUIANA, DUTCH.]

Surinam Toad (*Pipa americana*), a large toad found in Surinam. It was first noticed by Sibilla von Merian in 1708 and is characterised by a short, broad and pointed head, huge hind limbs



SURINAM TOAD.

with webbed feet and small fore limbs, the four slender webless fingers of which end in starlike projections. It has neither tongue nor teeth. Its colour is blackish-brown and it sometimes reaches a length of twelve inches. This repulsive-looking creature is especially remarkable

for the fact that the young undergo their metamorphosis in cells on the back of the female. At spawning-time the skin of her back is very soft and the male places the eggs on it. Each egg forms a kind of pit which is soon enclosed. The transformation, which, of course, includes the tadpole stage, is completed in eighty-two days.

Surplice (*super-pellicium*), a loose vestment of white linen with full open sleeves, fastened in front at the throat, and falling down all round the figure. It is worn during Divine service by deacons and priests and choristers and acolytes in the Latin and Anglican Churches and by members of the colleges of some English universities. The Latin surplice is shorter than the ordinary Anglican surplice, is often ornamented with lace or made of lace, and is worn over a cassock. The short Italian surplice as worn by acolytes and choristers is called a cotta.

Surrey, one of the metropolitan or "home" counties of England, bounded on the N. by Middlesex and a small portion of Buckinghamshire (with the Thames as a natural boundary), on the E. by Kent, on the S. by Sussex, on the W. by

Hampshire and on the N.W. by Berkshire. It occupies an area of 758 square miles. The surface is for the most part varied, and is traversed from east to west by the North Downs, which rise in the outlying spur of Leith Hill to a height of 965 feet. The north-west consists of heath and moorland overlying the London Clay. The Downs are Chalk, while the south is Greensand and Wealden. The chief streams are the Wey, Mole and Wandale, all flowing to the Thames. The principal crops are wheat, barley, oats, pease, turnips, potatoes and hops. Market-gardening flourishes in the vicinity of London, and near Mitcham lavender and other plants are cultivated for medicine, perfumery and the herbalist. Dairy-farming is of more importance than live-stock breeding, and hence the number of flocks and herds is comparatively small. Outside of the metropolitan area and the progressive borough of Croydon, the manufactures are mostly paper, gloves, hosiery, oil, brushes, brooms, bricks, glass, pottery, cement, fuller's earth, tobacco, and textiles, besides brewing, malting and tanning. Epsom is the most popular centre of horse-racing, the Derby and Oaks being among its annual fixtures. The county town is Guildford (15,937), but the County Council meets at Kingston (34,375). The outstanding event in the history of Surrey ("the southern kingdom") was the signing of the Great Charter at Runnymede (which just happens to be within the area) by King John in 1215. Pop. (1901), 2,008,923.

Surrey, HENRY HOWARD, EARL OF, poet, was probably born in 1518, at Kenninghall, Norfolk, the eldest son of Lord Thomas Howard, afterwards 3rd Duke of Norfolk. He was carefully educated, his tutor being John Clerk, an accomplished Oxford scholar. In 1536 Surrey went with his father into Yorkshire to repress the rising known as the Pilgrimage of Grace, and in 1540 distinguished himself at the jousts held to celebrate the king's marriage with Anne of Cleves, which was cancelled on July 12th. Surrey was twice committed to the Fleet for slight offences due, he admitted, to "the fury of reckless youth." In 1543 he was restored to favour and served with the king's forces at the siege of Landrecy, near Boulogne. In the year following, as marshal of the army, he was severely wounded at the storming of Montreuil. He was again in France in command in 1545, and was rebuked by Henry for exposing himself to needless danger, and when he fell upon a convoy at St. Étienne in 1546, his force was defeated and fled. His enemy, Edward Seymour, Earl of Hertford, uncle to the heir to the throne, superseded him. At the end of November the king was known to be dying, and rivalry as to the Protectorate became acute. Surrey openly asserted his father's claims. The Seymour faction were bitterly hostile and when Surrey, eager to prove the superiority of his ancestry over the *parvenu* Earl's, assumed the arms of Edward the Confessor, which he was entitled to do, it was construed into a treasonable design upon the Crown. Father and son were sent to the Tower. Surrey at his trial made a brave defence, but was found guilty, sentenced and beheaded on

Tower Hill on January 21st, 1547, and on the 28th the king died. His father remained a prisoner until Mary's accession. Surrey's poems consisting of sonnets, lyrics, elegies and paraphrases of the Psalms, were circulated in manuscript during his life, and ten years after his death were printed by Richard Tottel in his *Miscellany*, the first collection of English poetry by different writers. A better poet than Sir Thomas Wyatt, his senior, both took Petrarch as their model. In its most ardent moments their love-poetry is only Platonic. They introduced the sonnet, and Surrey devised a form which Shakespeare was to make the vehicle for some of his finest work. To Surrey alone belongs the distinction of introducing blank verse into English poetry, and his translations from the *Æneid* in this "strange meter" may have been suggested by an Italian blank-verse translation. In this also he was the precursor of Shakespeare, whose blank verse is the glory of our language.

Surveying is the science of measuring the shape and size of any portion of the earth's surface in order that a map or plan of it may be prepared. The area to be surveyed is divided up into a number of triangles, whose sides and angles are measured: the area can be calculated from the figures so obtained, and a plan can be made by reproducing the triangles on a reduced scale. The simplest appliances for the purpose consist of a chain and cross-staff or optical square. By means of the former the lengths of the sides of a triangle may be determined, and with the aid of the latter a perpendicular may be drawn from the bases to the apex of the triangle. From the observed lengths of the sides and the perpendicular, the area of the triangle can be ascertained, and it is evident that the area of a plot of land is the sum of the areas of the triangles into which it has been divided. For more extended surveys optical instruments for measuring angles are used. Three points are selected, and the distance between two of them is measured by a chain or otherwise. The angles between this base-line and the lines joining its extremities with the third point are then measured, and from these three measurements the area of the triangle may be calculated, as also the lengths of the two sides. Either of these sides may now be used as the base of a second triangle, and this process of triangulation may be repeated to any required extent. The headquarters of the Ordnance Survey of the United Kingdom are situated at Southampton.

Susa, a town of ancient Persia, was the capital of Susiana, and contained the winter palace and treasury of the Persian kings, these being enclosed by a fortified citadel. The city was quadrangular, is mentioned (as Shushan) in the Book of Daniel and by Pliny, and seems to have been watered by many streams, feeders of the Choaspes, on whose left bank it was situated. Its site is occupied by mounds, and bricks, pottery, cuneiform inscriptions, and other relics have been found.

Susanna, the chief character of an apocryphal book of the Old Testament, originally inserted by a

Greek writer in the text of Daniel. She is falsely accused of unchastity by certain elders, but rescued from death through the judgment of Daniel. The subject of "Susanna and the Elders" was a favourite with several of the Old Masters.

Suspension, **AXIS OF**, is the line perpendicular to its plane of motion, about which a pendulum swings. In considering a section of the pendulum by this plane, the axis reduces to a point called the centre of suspension. [**PENDULUM**.]

Suspensor, in botany, the chain of cells at the end of which the developing embryo is situated.

Susquehanna, a river of the United States, is formed by two branches, the main branch, from the north, rising in Otsego Lake, New York State, and the other rising in the Alleghanies. The two streams unite at Northumberland (Pennsylvania), and the river flows in a south-easterly direction past Harrisburg and Columbia into Maryland, and falls into Chesapeake Bay at Havre de Grace. The total length of the course is estimated at from 450 to 500 miles.

Sussex, a maritime county of England, bounded on the N. by Surrey, on the E. by Kent, on the S. by the English Channel and on the W. by Hampshire. It occupies an area of 1,458 square miles. The surface is undulating, and somewhat flat in parts, but in the south the South Downs pass through from east to west, their most eastern point being the noble cliff of Beachy Head, 530 feet high. They rise to a height varying from 400 to 900 feet, but the highest point in the county is Blackdown (918 feet) in the extreme north-west, on which stood Tennyson's house of Aldworth. The principal rivers are the Arun, Adur, Ouse and the two Rothers (one, in the west, joining the Arun, the other, in the east, falling into the sea near Rye). The chief crops are oats, wheat, barley, turnips, potatoes and hops. The South Downs are noted for their breed of sheep, whose flesh is said to owe its excellence as mutton to the fine air and sea-breezes, while the abundance of marsh land affords rich pasturage for cattle. Pigs and horses are also raised in considerable numbers. Dairy farming prospers and the fruit, flower, and market gardening of Worthing is of increasing importance. Of the forest tracts, St. Leonard's Forest and Ashdown Forest yet occupy vast areas. All this region of the Weald is rich in ironstone, and till the 18th century the Sussex iron had a great reputation. Hammer ponds, scattered here and there, are now the only relics of the forges. Other minerals comprise chalk, marble, clay, natural gas and gypsum. The fine climate of the southern coast gives it a special advantage as a place of residence, and Brighton, Eastbourne, Hastings, St. Leonards, Worthing, Bognor, Littlehampton and other towns are well-known sea-bathing resorts. The industries include the sea-fisheries, paper-making, brewing, milling and the making of bricks and tiles. The county is rich in historical associations, easily aroused by the names of Battle, Hastings, Lewes, Pevensey, Rye, Winchelsea, and it is of interest also to the antiquary. There are remarkable castles at

Arundel (still inhabited), Hastings, Lewes, Pevensey, Bramer, Bodiam and Hurstmonceux, and many picturesque seats, Petworth being one of the best-known. Lewes (11,249) is the county town and there is a cathedral at Chichester. Pop. (1901), 605,052.

Sutherland, a maritime county of Scotland, bounded on the N. by the Pentland Firth, on the E. by Caithness and the North Sea, on the S. by the shire of Ross and Cromarty and on the W. by the Atlantic. It covers an area of 2,102 square miles. The northern and western shores are wild, rugged and much indented, Cape Wrath (523 feet high) being the most north-westerly point of the mainland. The surface is mainly mountainous, the loftiest heights being Benmore Assynt (3,273 feet), Ben Klibreck (3,154), Ben Hope (3,040), Foinaven (2,980), Canisp (2,779), Ben Loyal (2,504) and Sulven or the Sugar-loaf (2,399). The rivers include the Oykel (the boundary with Ross-shire), Shin, Brora, Helmsdale, Halladale, Naver and the Dionard. Of numerous lochs the largest are Lochs Shin, Assynt, Naver and Hope. The soil is ill-adapted for cultivation, but oats, barley, turnips and potatoes are grown. The rearing of live-stock is of more consequence, and sheep-farming is in vogue to a considerable extent. Vast deer-forests occupy a large part of the surface, and the clearances of the crofters in the second decade of the 19th century in the interests of the deer-stalker aroused widespread indignation. The minerals include coal (at Brora), gold, limestone and sandstone. The only industries of importance are the fisheries and distilling. Helmsdale is the principal port and Dornoch the county town. To the Scandinavian invaders who crossed over from the Orkneys at the end of the 11th century, Sutherland was the southern land to Caithness. The dukedom was created in 1833. Pop. (1901), 21,440.

Sutlej, one of the five rivers that give its name to the Punjab, of which the Sutlej forms the eastern boundary. The river comes from a lake in Tibet at a height of 15,000 feet and flows through stupendous scenery as a rapid torrent, leaping from point to point, sometimes falling 150 feet in a mile. After a course of 150 miles westwards to Nako, it flows in a south-south-westerly direction through the Himalaya and to the east of the Punjab, receiving many tributaries, till, after a course of from 900 to 1,000 miles, it falls into the Indus.

Suttee (Sanskrit, *sati* = "good woman"), properly, a Hindu widow who is burnt alive on her husband's funeral pile; usually the Hindu rite of widow-burning. This cruel sacrifice was abolished on December 4th, 1829, by Lord William Cavendish Bentinck, when Governor-General of Bengal (afterwards of India). The regulation suppressing it declared that it would be punishable as culpable homicide.

Sutton, a town of Surrey, England, about 11 miles S.S.W. of St. Paul's Cathedral. Owing to its healthy situation on the verge of the Chalk downs, it has become a residential quarter of persons engaged in London. Some of the picturesque, old-

fashioned houses of the village are still extant. St. Nicholas's Church, which was rebuilt in 1864, contains memorials to Isaac Littlebury (d. 1710), the translator of Herodotus, and William, 1st Earl Talbot (d. 1782). Pop. (1901), 17,223.

Sutton Coldfield, a town of Warwickshire, England, 7 miles N.E. of Birmingham, situated in an extremely picturesque district. It owed much of its prosperity to John Vesey, a native, who was Bishop of Exeter in the 16th century, procured from Henry VIII. a charter of incorporation, built a town hall and market house, founded and endowed a school, granted an extensive park to the Corporation and died at the original Moor Hall in the parish in 1555 at the age of 103. The principal buildings are the Holy Trinity Church, in the Early English and Perpendicular, the aisles of which were the work of Vesey, and which contains a carved oak screen constructed from part of the choir furniture of Worcester Cathedral removed in 1865; the modern town hall in the Gothic, and the Princess Alice Orphanage. New Hall, to the south of the town, a castellated structure with a moat, dating from 1200 and enlarged in 1360, is now a college for boys; while the double moat of Peddimore Hall, to the east, once the seat of the Ardens, a family who occupied this district before the Conquest, still remains, though the ancient mansion has given place to a farmhouse. Pop. (1901), 14,264.

Sutton-in-Ashfield, a town of Nottinghamshire, England, 3 miles W.S.W. of Mansfield. The church of St. Mary Magdalene (restored in 1868) was built in the 14th century, but incorporates part of the earlier structure erected in 1170. In the churchyard is a yew tree 700 years old. The inhabitants are chiefly engaged in the collieries and the manufacture of cotton, thread, silk and hosiery. Pop. (1901), 14,862.

Suture. [For the cranial sutures, see SKULL.] The term is also applied to the materials employed and the methods adopted in bringing into apposition the cut surfaces of wounds.

Suwaroff, or **Suvoroff**, ALEXANDER VASILIEVICH, field-marshal, was born at Moscow, Russia, on November 24th, 1729, and entered the army at an early age as a private soldier. His bravery and strongly-marked character soon became noticeable and he distinguished himself in the Seven Years' War, the Polish War of 1768-71, and the two wars against Turkey (1773, 1789-90). The Polish War of 1794 was brought to a close by his capture of Praga, a suburb of Warsaw, when the victory was sullied by the massacre of 15,000 Poles. For this success Suwaroff was promoted field-marshal. After the death of Catharine in 1796, he lived for a time in retirement at Kantchansky, his seat in the province of Novgorod, but in 1799 he was placed in command of the army sent to operate against the French in Italy. He defeated Moreau on the Adda, Macdonald on the Trebbia, and Joubert at Novi, but, owing to the success of Masséna, failed to follow up these advantages in Switzerland. He retreated into Russia through Bavaria, and, being

recalled in disgrace, died at his country-seat on May 18th, 1800.

Svendsen, JOHAN SEVERIN, composer, the son of a military bandmaster, was born at Christiania, Norway, on September 30th, 1840. He enlisted when only fifteen and being already a skilful violinist and player on the flute and clarinet soon became a bandmaster. Leaving the army he spent sometime in the orchestra of the Christiania Theatre, but a strong desire to travel impelled him to tour in Sweden and North Germany. He resumed the study of the violin at Lübeck, but paralysis of the hand necessitated his devoting himself to composition. With the assistance of the King of Sweden he entered the finishing class of the Leipzig Conservatorium and on leaving in 1867 was awarded the honorary medal of the Academy. He now made an extended tour visiting the British Isles and Paris, where he remained until the outbreak of the war of 1870 when he returned to Leipzig and was offered the conductorship of the once well-known Euterpe concerts. In 1871 he married an American lady and in the next year at Bayreuth met Wagner with whom he formed a close friendship, spending his happiest days in becoming acquainted with that great master's ideas. He returned to his own land in 1872 and was for five years conductor of the Christiania Musical Society. After revisiting Leipzig in 1877 and living for a time in Rome, London and Paris, he returned to his conductorship in Christiania in 1880 and in 1883 became Court Capellmeister at Copenhagen. Svendsen's music is of a high character and marked individuality although Beethoven's influence is discernible. A composer's first work rarely attains the wide popularity of Svendsen's *String Quartet in A minor*, while his *Octet for Strings in A minor*, op. 3, carried his reputation over the musical world. His master, Reinecke, declined to suggest any improvement in it and said, "The next thing will be a symphony, I suppose." The young musician accepted the challenge and a week later placed his *Symphony in D*, which established his fame, before the delighted Reinecke.

Swabia, or SWABIA (German, *Schwaben*), so called from the Suevi who inhabited it of old, is an ancient German duchy. It, together with Bavaria, formed the kernel of the newly-formed Germany (843). In 1376 was founded the Swabian League, and in the 14th century it constituted the south-western and most fertile part of Germany. It was bounded on the N. by the Rhenish Palatinate, on the E. by Bavaria, on the S. by Switzerland and on the W. by France, being separated from the last two countries by the Rhine. Swabia, which contained 13,000 square miles and had for its capital Augsburg, is now divided among Württemberg, Bavaria, Baden, Hohenzollern and Liechtenstein.

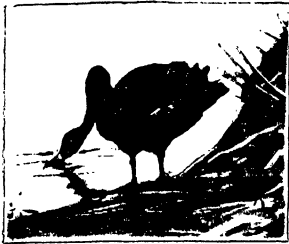
Swahili (WA-SAHILI, "Coast People," from the Arabic, *sahel* = "coast"), the mixed Arabo-Bantu Mahomedan populations of Zanzibar and the neighbouring mainland from Mombasa nearly to Mozambique. Amongst the upper classes the Arab

type is more pronounced, and many even claim pure Arab descent. But all the rest are a hybrid people, the outcome of continuous interminglings with all the tribes of the interior represented by the convoys of slaves which for ages were brought down to the coast and gradually absorbed in the Mahomedan families. Their language also, although preserving its original Bantu structure, has become largely affected by the Arabic element, and is written both with the Arabic and the Roman alphabet, the Mahomedans using the former, the Christian missionaries the latter. Owing to the enterprising spirit of the Wa-Swahili, who traverse the interior in all directions as traders, slave hunters, caravan leaders, and carriers in the service of the Europeans, this Ki-Swahili language has become the chief medium of intercourse throughout a great part of the continent as far west as the Upper Congo and from Uganda to Nyasaland.

Swallow, a bird belonging to the cosmopolitan family Hirundinidæ of Passerine Birds, of which *Hirundo* is the type-genus. There are several genera and about 100 species, mostly insectivorous birds, that take their prey on the wing, though some feed on berries. The wings are long and pointed, the legs and feet are small, and the tail is usually forked. The type-genus, with the range of the family, has about forty species, three of which visit the United Kingdom in the summer. The Common or Chimney Swallow (*H. rustica*) arrives in England about the middle of April, and is looked upon as the harbinger of summer (but at the same time the proverb warns us that "one swallow does not make a summer," even though, as *Punch* adds, "it may make a spring"). The length of the adult male is about eight inches, of which the deeply-forked tail counts for five. The upper surface and a band across the chest are glossy blue-black, the forehead and throat chestnut, and the under parts buffy white. The hen-bird is a little smaller. The nest of mud and clay is lined with feathers, and there are usually two broods in a year. These birds assemble in large flocks in autumn before migrating south. The House-Martin, or Window Swallow (*H. urbica*), may be distinguished by its smaller size, the white patch on the rump, and the absence of the chestnut on the throat and of the blue-black band on the breast. The feet are covered with downy feathers. The Sand-Martin (*H. riparia*) is the smallest of the three and is the first to arrive in England. The plumage on the upper surface and on the breast is brown, and white beneath. The toes are not feathered. The nest is placed at the end of a gallery excavated in sand-banks, cliffs, river-banks, and similar situations. According to Scandinavian folklore, the Swallow flew around the Cross crying "Svala! Svala!" and hence was named Svalow, "the bird of consolation." Amongst the Romans it was held to be a sign of good luck when a Swallow built its nest about the house, and to kill or injure one presaged ill-fortune. [SWIFT.]

Swallow-tailed Butterfly, any member of the family Papilionidæ having lengthened processes of the hind wings, making a form resembling a swallow's tail.

Swan, a bird belonging to the genus *Cygnus*, of the Duck family, of which they are the largest members. There are about ten species, chiefly from the temperate regions of the Northern and Southern hemispheres. The bill is about as long as the head and the neck is long and arched; the short legs



BLACK SWAN.

are set far back and give these birds an ungainly appearance on land, though they are exceedingly graceful in the water; the three toes in front are webbed and the hind toe is free. They feed principally on aquatic vegetation, but they also consume great quantities of fish-spawn. Their usual note is a loud hiss, but the call of the male in the breeding season is a trumpet-like note. The Common, Mute, or Tame Swan (*C. olor*) is partially domesticated as an ornamental bird in the United Kingdom and on the Continent. The total length is about five feet. The plumage of the adults is pure white, but that of the young birds or cygnets is bluish-grey. The Polish Swan (*C. immutabilis*) is now reckoned a variety, though formerly considered distinct, from the fact that the plumage of the cygnets was white. The Wild Swan, Elk, or Whooper (*C. ferus*), and Bewick's Swan (*C. bewicki*) visit Great Britain in their migration southwards. The North American Swans, like those of Europe, are white-plumaged. The Black-necked Swan (*C. nigricollis*) is South American and the Duck-billed Swan (*C. anatinoides*), from Magellan Straits, has the head and neck brown. The Black Swan (*C. atratus*) is Australian and is far from uncommon, though Juvenal, of course, was justified by the then state of zoological knowledge when he wrote in his *Satires*, "*Rara avis in terris nigroque simillima cygno*" ("a rare bird on the earth and very like a black swan"). The notion that the swan sings just before death is unfounded in fact. Nor can its voice be deemed musical, if, as has been averred, it resemble the creaking of a sign-board with a rusty hinge when blown to and fro by the wind. Swans are birds-royal and to steal a tame swan or one bearing the mark of the Crown is felony. Every summer the Vintners' Company of London proceeds to the Upper Thames to superintend the process (known as "swan-upping") of cutting a mark on the upper mandible of the birds belonging to it.

Swan, JOHN MACALLAN, artist, was born at Old Brentford, Middlesex, England, on December 9th, 1847. He began his artistic studies at the Worcester School of Art, and at the Lambeth School of Art under John L. Sparkes. In Paris he studied painting under Gérôme, Bastien-Lepage, Dagnan-Bouveret, and sculpture under Frémiet. He first exhibited at the Royal Academy in 1878 and has

exhibited there regularly ever since, his pictures consisting chiefly of figure and animal subjects. He also exhibited at the Grosvenor Gallery and the New Gallery. In 1894 he was elected an Associate of the Royal Academy, becoming a full Academician in 1905. He is a member of the Dutch Water-Colour Society, and of the Royal Water-Colour Society; and honorary member of the Secessionists, Berlin, Brussels and Vienna. Both as sculptor and painter he has been the recipient of numerous honours, notably the silver medal at the Paris International Exhibition of 1889; 1st and 2nd gold medals at Munich; 1st class gold medal for painting and 1st class gold medal for sculpture at the Paris Exhibition in 1900. His pictures are remarkable for their delicacy and refinement of treatment, beauty of colour and form. His studies of animals are probably unsurpassed for grasp of character, naturalness of pose and appreciation of form. His chief pictures include "Orpheus"; "The Prodigal Son," bought by the trustees of the Chantrey Bequest in 1889, and now in the Tate Gallery, London; "Lioness defending her Cubs"; "A Dead Hero," and "Polar Bears Swimming." The Luxembourg Museum in Paris possesses some small examples of his sculpture work in bronze.

Swan, SIR JOSEPH WILSON, inventor, second son of John Swan, was born on October 31st, 1828, at Sunderland, Durham, where he was apprenticed to a chemist. He became an assistant and afterwards a partner in a firm of manufacturing chemists in Newcastle, who were makers of photographic plates. His observations on the effect of heat in increasing the sensitiveness of a gelatino-bromide of silver emulsion led to the production of the rapid dry plates which revolutionised the art of photography. In 1862 he patented a process for carbon-printing, better known as the Autotype, for making permanent photographs, and was also co-inventor of the Woodburytype, and one of the first inventors of the methods of photo-engraving for typographic and copper-plate printing. Sir Joseph is most widely known by his invention of the incandescent electric lamp after many years spent in experiment. In 1860 he made an electric lamp with a carbon filament of paper or card, charged with charcoal powder. In the later improvements he used cotton thread parchementized by the action of sulphuric acid. On October 20th, 1880, he first exhibited his method of electric lighting by means of glow lamps, which were the forerunners of all the incandescent electric lamps now in use. Elected a fellow of the Royal Society in 1894, in 1901 he received the Honorary degree of D.Sc. from Durham University, and in addition to many other distinctions which have been conferred upon him in recognition of his inventions, he was knighted in 1904.

Swanage, a watering-place of Dorsetshire, England, situated on the so-called Isle of Purbeck, 9 miles S.E. of Wareham. Owing to its eastern exposure it is one of the few places on the English Channel that are bracing in midsummer, and on this account and because of its picturesque position and surroundings it is a favourite holiday resort

with all who desire quiet. The stately ruins of Corfe Castle stand about five miles to the north-west. Pop. (1901), 3,384.



THE QUAY, SWANAGE.
(Photo: Poulton & Son, London.)

Swan River. [WEST AUSTRALIA.]

Swansea, a seaport of Glamorganshire, Wales, situated at the mouth of the Tawe—whence its Welsh name of Abertawe—on Swansea Bay, a northern arm of the Bristol Channel, 36 miles W.N.W. of Cardiff. The ancient town consisted of a few narrow streets at the mouth of the river, defended by a castle founded in 1099 and now ruinous; but the modern town faces the bay, and its sands, parks, and pure water-supply make it a popular place of resort. Its proximity to the coal-fields gives it great facility for carrying on its chief industry of copper-smelting. Tin-plate, lead, zinc, iron, steel also are worked. More than two million tons of coal and patent fuel are exported yearly by sea and rail. The tonnage of vessels entered and cleared annually amounts (exclusive of coastwise) to over 1,500,000. The extensive docks are divided into North, South, Beaufort, Prince of Wales and the New Docks. Among the more prominent buildings are the town hall, St. Mary's Church, the Royal Institution of South Wales, the free library, the grammar school founded in 1682, the market, the Albert Hall, the Prince of Wales Hall, the art gallery, museum, hospital, and several charitable institutions. Pop. (1901), 94,537.

Swasiland, a territory of South Africa, lying between the Drakensberg Mountains in the west and the Lobombo Hills in the east and occupying the south-eastern corner of the Transvaal. It covers an area of 6,536 square miles. Its independence was at first acknowledged (1884), but under the Convention of 1894 its control was entrusted to the South African Republic, with which, however, it was not incorporated. After the Boer war its administration was taken over by the British authorities (1904), native rights being duly safeguarded. The minerals include gold, tin, copper and coal, and maize, millet, pumpkins, ground nuts, beans and sweet potatoes are grown for the local wants. Mbabane is the seat of government. Pop. (1904), 85,484, all of Zulu type, excepting 900 Europeans.

Sweat, or PERSPIRATION, the moisture secreted from the skin by the sudoriparous glands. It contains about 5 parts of solids in 1,000 parts. These solids consist of mineral salts, extractives, fatty substances and certain organic acids.

Sweating, in certain trades, strictly means sub-contracting—i.e., instead of hiring workers directly, "putting the work out" through middlemen, who make their profits by cutting down the wages paid. The House of Lords Select Committee, however, which reported in 1890 on the question as it concerned London regarded the middleman as a mere incident and not as a factor in the system. The trades chiefly affected are tailoring, bootmaking and cabinet-making. More loosely, the term is applied to the system of paying for piecework at so low a rate that starvation can only be kept off by overwork. Apart from the iniquity of remunerating work by starvation wages, the conditions in which very many of the sweated labour are insanitary to such a degree as to be a menace to public health. The phrase appears to have come into vogue in the beginning of the 19th century, and the horrors of the system inspired Charles Kingsley's *Alton Locke* (1850) and organized the Christian Socialists, while they were denounced (at least by implication) by Thomas Carlyle in *Past and Present* (1843).

Sweating Sickness, an epidemic disease which committed great havoc in England in the 15th and 16th centuries. Hence it was sometimes known as Sudor Anglicanus, or "the English sweat," although it also made its appearance on the Continent. It is plausibly conjectured to have in some degree resembled influenza.

Swede, originally known, from the country of its origin, as the Swedish turnip, is *Brassica campestris*, var. *Rutabaga* or *Napo-brassica*. It is a most valuable food for sheep, yielding far heavier crops than the common turnip. Its introduction into England in the 17th century effected a revolution in the agriculture of the United Kingdom. The swede flourishes in the moist summers of Scotland, but suffers much from the attacks of the turnip-beetle.

Sweden, a kingdom of Europe, occupying the eastern, the more fertile and the more populous part of the Scandinavian peninsula. It lies between 55° 20' 18" and 69° 3' 21" N., and 11° 6' 29" and 24° 10' E., and is bounded on the N. by Norway, on the E. by Russia (Finland), the Gulf of Bothnia and the Baltic, on the S. by the Baltic and the Sound, and on the W. by the Cattegat, Skagerrak, and Norway. It has an area of 172,876 square miles; its longest line measures nearly 1,000 miles, the greatest breadth being 280 miles. The length of the coast-line is about 1,600 miles.

Physical Features. Only the northern and north-western parts of Sweden can be called mountainous. About one-third of the area of the whole country lies lower than 300 feet above the level of the sea, and scarcely a twelfth part lies higher than 2,000 feet above the sea. From the Kjölén range, which forms the boundary between Norway and Sweden,

the country stretches as a broad plain, sloping towards the Gulf of Bothnia on the east and towards the large lakes and flat districts in the southern provinces. The most important range of mountains begins on the Norwegian border near Lake Fæmundaö, and extends first in an easterly and afterwards in a southerly direction through the whole of Central and South Sweden down to Scania, the most southerly province. Near the Norwegian border, north of the Arctic Circle, is situated Sulitelma, one of the highest peaks in Sweden (6,178 feet), the loftiest peaks being Kebne-Kaisse (7,008 feet) in 67° 52' and Sarjektjåkko (6,988 feet) in 67° 14'. The central part of the country is a land of large and extensive lakes, occupying about an eighth of the total area. The most important of these are the Vener, Vetter, Mälär, and Hjelmar lakes. They are connected by rivers and canals, and communicate on the west with the Cattegat and on the east with the Baltic. Sweden is rich in rivers, amongst them the Klar Elf, Dal Elf, Pitea, Lulca, Angerman, and Göta Elf. On the last-named, not far from Gothenburg, is the celebrated waterfall, the Trollhättan. Geographically and politically, Sweden is divided into three divisions—Norrländ, Svealand, and Gothland. The first is full of virgin forests and mountainous districts, through which run numerous streams and rivers. The Laplanders (a Mongolian race), with their reindeer, chiefly inhabit this part of the country, where a great number of wild animals—reindeer, bears, wolves, foxes, many kinds of birds of prey, game birds, ptarmigan, snipes, etc.—abound. In Svealand, the central part, occur the grander lakes and tracts of forest. This section is also known for its iron and copper mines. Gothland is the most southerly division, and contains the best and the greater part of the cultivated land. The fundamental rocks consist mostly of crystalline gneisses and granite of the Azoic period, and may be classed into three divisions—the grey gneiss, the red iron gneiss, and the granulite. The iron deposits occur in more or less fine-grained gneiss or granulite. Gold, silver, copper pyrites, and zinc blende are also found. During the Glacial period Sweden was wholly covered with ice, and the most recent deposits date from that period. The Skärgård is a collection of small and low islands, or skerries, on different parts of the coast.

Climate. The climate varies very much on account of the vast extent of the country from north to south. In the northern parts and along the Norwegian border the winters are very severe, though much colder on the Baltic and Gulf coast than on the Cattegat and Skagerrak shores. The south enjoys, as a rule, long and warm summers, but both summer and winter are in all parts liable to great fluctuations from year to year.

Population; Industries and Commerce. The population has increased steadily during the last hundred years. In 1904 it numbered 5,260,811, of whom some 20,000 were Finns, 7,000 Lapps, and 3,400 Jews. The greater part, about 80 per cent., live in the rural districts. The largest towns are Stockholm (317,964), Gothenburg (138,030), Malmö (70,797), and Norrköping (44,378). Agriculture is

the most important industry, although only about 9 per cent. of the total area is under cultivation. In the southern districts the crops consist principally of rye, barley, wheat, and potatoes, in the less fertile districts of oats, which find a good market in England. The country produces more corn than it consumes; it has also a large export of butter to England. The cattle exceed 2,500,000 head, there are over 1,000,000 sheep, half a million horses, and 800,000 pigs. The forests (mostly pine and fir) occupy more than half of the entire area, and timber is therefore one of the most important articles of export. About one-half goes to British ports. Mining is also one of the leading industries. Of the iron mines those of Dannemora in Upland, Norberg in Vestmanland, and Grängärde in Kopparberg are the most valuable. There are also several copper, zinc, nickel, and silver mines. Coal is found in the south. The inhabitants on the coast and the small islands, the Skärgård, are mostly fishermen. Herrings, sprats, salmon, mackerel, haddock, and cod are the principal fisheries. The most noteworthy industries are ironworks, foundries, flour, wool, cotton and paper mills, sugar refineries, breweries, clothing and tobacco factories, tanneries, match manufactories, glass and porcelain works, engineering, distilleries, and shipbuilding.

Government; Army and Navy. Sweden is a constitutional monarchy under one king, in whom the executive power is vested. The king is advised by a Council of State and shares the legislative power with the Riksdag, or Diet. There are two chambers in the National Assembly, the members of the first being elected for nine years by provincial councils and by the municipal councils of some of the large towns (one member for every 30,000 inhabitants). Candidates for the First Chamber must be 35 years of age and possess property to the amount of at least £4,500. The members for the Second Chamber are elected for three years, one for every rural district of less than 40,000 inhabitants, two for every district with a population exceeding that number, and one for every 10,000 in the towns. The right of vote for the Second Chamber belongs to every male adult who possesses property to the amount of £55, or for at least five years has held a lease of property valued at least at £330, or who pays taxes on an income of and above £45 a year. The members of the Second Chamber are paid £66 apiece for a session of four months, while the members of the First receive no remuneration. The 25 läns, or provinces, and the city of Stockholm are administered by a Landshöfding, or governor, and a provincial council. For the purpose of collecting taxes and the preservation of peace, the läns are divided into 118 Fogderier or bailiwicks. The parishes and towns have a large measure of self-government vested in their local, parish, or town councils. For judicial purposes the country is divided into härad, or districts, each administered by a häradshöfding, or president, and 7 to 12 Nämndemän or jurymen, generally elected from among the peasant proprietors of the district. In the towns the judicial authority is vested in the

magistrate. There are three superior courts of justice—Svea Hofrät in Stockholm, Gotå Hofrät in Jönköping, and Skane and Blekinge Hofrät in Kristianstad. The highest court of appeal is the king's Högsta Domstöl in Stockholm. Trial by jury is only legalised in cases of offences by the press. The army consists of a standing army and a militia. The first is recruited from men, who are enlisted for three or four years and form a class, called the Indelta, who receive a yearly pay and a free cottage. In times of peace the standing army numbers about 35,000 men and 2,200 officers, while the war footing has not been ascertained. The militia is made up by conscription drawn by annual levy from the male population between the ages of 21 and 40. The reserves thus practically established are estimated at 450,000 men. The navy is maintained almost wholly for coast defence. The king is the highest in command of the army and the navy.

Character of the People: Religion and Education. The peasantry are a hardy, intelligent, and industrious people, very religious and loyal to their sovereign. The State religion is that of the Lutheran Church, ruled by the Archbishop of Upsala and thirteen bishops. Nearly the whole of the population belongs to the State Church, the Dissenters—Baptists, Methodists, Greek Catholics, Roman Catholics, Jews, Irvingites, and Mormons—forming quite an inconsiderable minority. Sweden stands high in education, which is compulsory but free. Besides excellent elementary schools, there are numerous high and technical schools and two universities (Upsala and Lund).

History. Sweden has only gradually acquired its present boundaries, and developed into one complete state. The southern part (Scania, Halland, and Blekinge) was originally united to Denmark; other parts (Bohuslän, Jämtland, and Herjedal) have at times belonged to Norway, at other times to Sweden. The country was first inhabited by the Lapps, who, according to Montelius, about 1500 B.C. were driven into the northern forests by two invading Teutonic races, the Goths, who settled in the south (Gothland), and the Swedes, who settled in the central part around the great lakes (Svealand). Their manners, customs, and language were the same, but at the dawn of Swedish history we find them at war with one another and the enmity continued till, in the 13th and 14th centuries, they gradually merged into one nation. In 1397 Sweden became one of the confederate kingdoms of Scandinavia (Denmark, Norway, and Sweden) under the Treaty of Kalmar, but this union only brought trouble and disaster, and was at last blotted out by the fearful massacre of Stockholm in the reign of Christian II. (1520). At this time Gustavus Vasa appeared as the saviour of his country and succeeded eventually in driving out the Danes. He was elected king in 1523, and reigned for 41 years, during which time Sweden prospered and made great progress. His successors were less fortunate in maintaining peace, but at last the fine qualities of the founder of the Vasa dynasty revived in Gustavus Adolphus II., whose name as a statesman

and general soon became known throughout Europe and who lost his life on the battlefield of Lützen. During the reign of his son, Charles XI., and his immediate successors, Sweden was again troubled with internal strife and discord, and lost also several of its provinces beyond the sea—Bremen, Verden, Hither-Pomerania, Livonia, Esthonia, etc. Thus she fell from the rank of a leading Power, which she had held for nearly a century, till the gifted Gustavus III. in 1772 put an end to the deplorable state of affairs and reframed the constitution. He was a patron of learning and founded the Swedish Academy. His war with Russia (1788–90), however, brought the country only loss and no advantages. Under his two successors the misfortunes of Sweden came to an end by the loss of Finland in 1809. In 1810 Bernadotte, the well-known French general, was adopted by the feeble and childless Charles XIII. as heir to the Swedish Crown, and succeeded in 1818 as Charles Johan IV. On the death of Charles Johan in 1844 his son, Oscar I., succeeded to the throne, who again was succeeded by his eldest son Charles XV. During his reign an important reform in the constitution took place. Instead of the four Ständer or estates of the realm—those of the aristocracy, the clergy, the burghers, and the peasants—the Diet was divided into two chambers—the First and the Second Chambers. Charles XV. died in 1872, when his brother, Oscar II., ascended the throne. In 1814 Sweden entered into union with Norway under one king, each country remaining a free and independent kingdom with its own constitution, government, parliament, and army. Considerable friction between the two countries arose, however, in consequence partly of Norway's demand for greater independence in her foreign policy, and in 1892 the position of political deadlock was almost in sight. In 1905 matters reached a crisis and Norway definitely severed herself from Sweden (October 26th, 1905), but offered her crown to a prince of the reigning house of Sweden, an offer that was forthwith declined.

Literature. The oldest productions in the Swedish language are a series of manuscripts of common laws or codes and some folk-songs. The first printed book in Swedish appeared in 1495. The 16th century added but little to the literature of the country, but the reign of Adolphus II. was adorned by one great writer, Georg Stjernhjelm (1598–1672), “the father of Swedish poetry.” After the king's death he was attached to the Court as poet-laureate by Queen Christina. A more brilliant period followed the death of Charles XII., to which belonged Olaf von Dalin (1708–63), a writer of marked elegance in prose and verse, Hedwig Charlotta Nordenflycht (1718–63), a graceful poetess, and the two poets Gustaf Gutz (1729–85) and Gustaf F. Gyllenberg (1731–1808). Karl von Linné or Linnæus (1707–8), the illustrious *savant*, wrote almost entirely in Latin, and Emanuel Swedenborg (1688–1772), the visionary, wrote also in the same language. The so-called Gustavian period (1771–1809) was rich in literary talent. The Swedish Academy was founded and literature began to partake more of a national character. In 1773 the National Theatre in Stockholm opened

with an opera written by the king himself. To this period belong: Anna Maria Lenngren (1754-1817), a popular writer of verse, Karl Mikael Bellman (1740-95), one of the most original and most popular of Swedish poets, and Johan Henrik Kellgren (1751-95), a writer of power and versatility. Frans Mikael Franzén (1772-1847), the lyrical poet, fills up the space between the Gustavian and the Romantic period. In the early part of the 19th century appeared the works of Erik Gustaf Geijer (1783-1847), the famous historian, and of Essaias Tegnér (1782-1846), the well-known poet. The latter's *Frithjofs Saga* is known in England through several translations. Erik J. Stagnelius (1793-1823) and Erik Sjöberg (Vitalis) (1794-1828) were two gifted poets, whose works are still much read. Karl J. L. Almqvist (1793-1866) wrote prose of fine qualities, and one of the most popular novelists was Fredrika Bremer (1801-65), whose stories are translated into all European languages. Anders Fryxell (1795-1881) was the most widely-read of historians. Johan Ludwig Runeberg (1804-77), a native of Finland, stands as a poet in the first rank, Wilhelm von Braun (1813-60) as a lyrist, and August Theodor Blanche (1811-68) as a dramatist and novelist. Other novelists of reputation are Emilie Flinck Carlén (1807-92) and Maria Sofia Schwartz (b. 1819). Z. Topelius (1818-98) was also a highly successful novelist and poet. The later school of writers includes A. Strindberg, novelist, dramatist, Anna Charlotta Edgren (1849-92), another novelist and dramatist. Tor Hedberg (b. 1861), G. von Geijerstam (b. 1858), novelist, Erik Agrell (b. 1849), dramatist, and Viktor Rydberg (1828-95), a writer of masterly novels and historical romances.

Ethnology. Nearly all the inhabitants of Sweden are Svenskar, true Swedes, descendants of the Gautar (Goths) and Svear (Swedes), two kindred Low German peoples in occupation of the southern districts since the Bronze epoch. Throughout the historic period the country appears to have remained in almost exclusive possession of these first immigrants, who at last blended in a homogeneous nationality. The inhabitants are thus one of the most uniform in Europe, being essentially Low German in physique, speech, and traditions, and presenting no differences traceable to the two original elements, except perhaps some local usages and provincial dialects. Such contrasts are most pronounced amongst the Dalecarlians of the Upper Dal basin, best representatives of the Svears as opposed to the Gautar of the extreme south. Physically the Swedes are tall (mean 5 feet 10 inches), with slim figure, stout frame, oval head, broad open forehead, regular features, deep blue eyes, florid complexion, frank and perhaps somewhat haughty expression. They are a brave, lively, and courteous people, the "French of the North," as they are fond of calling themselves. Intellectually they yield to none, and display a marked aptitude especially for the physical and natural sciences. The Swedish language, a direct descendant of Old Norse, appears to have taken decided shape about the 13th century, from which period date the oldest extant national songs and laws of the land.

It has been sedulously cultivated, especially since the Reformation, and is distinguished from the sister Dano-Norwegian tongue by greater harmony, a distinct musical accent or intonation, and some minor grammatical features. Outside Sweden it is current on the south-west and west coast of Finland, where the Swedes have been settled in compact masses for several centuries.

Swedenborg, EMANUEL, founder of the "New Church" signified by the New Jerusalem in the Revelation," commonly known as the Swedenborgians, was born at Stockholm, Sweden, on January 29th, 1688. He was the son of Jesper Svedberg, who afterwards became Bishop of Skara. After studying at the university of Upsala he travelled in England, Holland, France, and Germany (1710-15), receiving from Charles XII. on his return the appointment of assessor in the Swedish college of mines. In 1719 the family was ennobled, its name being changed from Svedberg to Swedenborg. The *Opera Philosophica et Mineralia* (1734) entitled Swedenborg to rank high among natural philosophers and original thinkers, although it carries speculation far beyond the limits warranted by experience. Absorbed in the effort to discover the ultimate explanation of the physical and spiritual world, his views became ever more visionary, and in 1745 he believed he had received a special revelation, communicated to him by the Lord Himself, which it was his duty to make known to his fellow-men. Much light has been thrown on the circumstances attending this vision, which took place in London, by the *Diary* first published in 1858. Swedenborg resigned his civil employment in 1747, and henceforward divided his time between Sweden, England, and Holland, devoting himself entirely to the composition of his theological works. The *Arcana Cælestia* (8 vols., 1749-56) contains a summary of his principal views, including the doctrine of correspondences, according to which everything good or bad in the natural world has its counterpart and explanation in the spiritual life of man. He applies this doctrine to the explanation of the Bible, regarding water, for example, as equivalent to truth, but only parts of the Scriptures commonly received as canonical are susceptible of this interpretation. Swedenborg firmly believed that he enjoyed free intercourse with angels and departed spirits, and gave a full description of the abodes of the blessed in heaven. On several cardinal points of Christian doctrine his views were decidedly unorthodox. He affirmed that the Last Judgment had visited the world in 1757, and that by Christ's second coming was meant the new dispensation which began with the foundation of the "New Church." He died in London on March 29th, 1772.

Sweet Potato (*Ipomœa Batatas*), a convolvulaceous plant, is unknown in a wild state, but is extensively cultivated throughout the tropics and in Southern Europe. Its tubers reach a far larger size than those of the potato, from which they also differ in containing 3 per cent. of sugar. They weigh about four or five pounds each. An allied

species, *I. ohrysaorhiza*, is the "kumarah" eaten by the Maoris.

Sweet William (*Dianthus barbatus*), a pink belonging to the south of Central Europe, from the Pyrenees to the Balkans and Carpathians. It is an old-fashioned garden favourite. It has broad, glabrous leaves and corymbose fascicles of flowers, smaller individually than an inch across. The petals are toothed, and are of various shades of red with dots and rings of white or other shades of red.

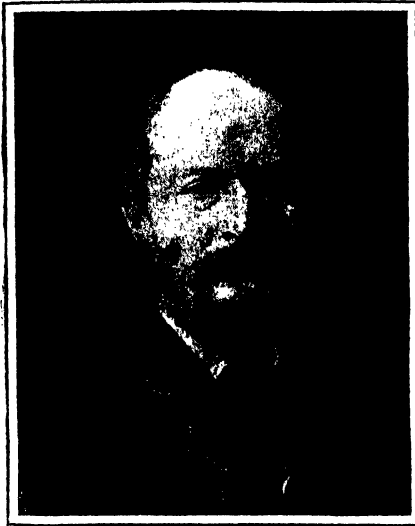
Swift, a bird belonging to the Picarian family Cypselidæ, or to its type-genus Cypselus. These birds are remarkably swallow-like in appearance and habit, but their close relationship to the humming-birds is shown by their structure. The family, which contains seven genera, with about 50 species, is almost cosmopolitan, New Zealand being the only sub-region in which none is found. The bill is short and weak, the wide gape is fringed with bristles, the wings are long and pointed, and the tail is short. There are two groups:—(1) The True Swifts, in which all the toes are directed forwards; (2) those in which the first toe is directed backwards. In this last group the tail-feathers are mucronate, whence the species are often called Spine-tailed Swifts. The Common Swift (*C. apus*) is found pretty plentifully in summer over the north of Europe and Asia, arriving later and leaving earlier for its southern winter quarters than the swallows. The general plumage is a brownish-black, glossed with bronze, and there is some white on the throat. The long wings are sickle-shaped, and from their rapid flight these birds derive their popular name. Their chief food consists of insects, and they reject the hard parts in the form of pellets. The nest is formed of bents, dried grass, feathers, etc., cemented together with a glutinous secretion. There are usually but two eggs, and more than one brood in a season is the exception. The Alpine or White-bellied Swift (*C. alpinus*) is a rare British visitor, though it spends the summer among the mountains of Central and Southern Europe. The Swiftlets (*Collocalia*) make the edible bird's-nests, and some other members of the family use salivary secretions in nest-building.

Swift, JONATHAN, Dean of St. Patrick's and antirist, was born in Dublin on the 30th of November, 1667, being remotely related on his mother's side to Robert Herrick, and on his father's to John Dryden. By the death of his father, seven months before his birth, he was left to the care of his uncle, Godwin Swift, who put him to school at Kilkenny, and afterwards entered him at Trinity College, Dublin. Losing his uncle in 1688, he came to England and in 1689 was taken up by Sir William Temple, a connection of his mother, who installed him at Moor Park, near Farnham, Surrey, as his secretary. After some years he became dissatisfied with his position, and returned to Dublin, taking orders as priest in 1695, and being presented to the prebend of Kilroot, near Belfast. In the following year he went back to Moor Park as Temple's literary assistant, and the relation continued until

1699, when his patron died, bequeathing him his manuscripts and a legacy of £100. Returning once more to Ireland, he obtained in 1700 the vicarage of Laracor with the living of Rathbeggan. He had already, while at Moor Park, written *The Tale of a Tub* and *The Battle of the Books* (both published together in 1704, though they had circulated in manuscript some years before). In 1701 he took his D.D. degree at Dublin. He now gave himself up largely to political writing, spending much of his time in London in the company of the leading wits and politicians of the day and forming an intimacy with Harley and Bolingbroke. Throwing his influence more and more on the Tory side, he at last, in 1710, became editor of the *Examiner*. Among his writings in these years were the *Argument to Prove the Inconvenience of Abolishing Christianity* (1708), the *Conduct of the Allies* (1711), and the *Proposal for Correcting, Improving, and Ascertaining the English Tongue* (1712). The reward of his incalculable services to the Tories was long delayed, and when, in 1713, it came, it was not the English bishopric he had expected, but the deanery of St. Patrick's, which he accepted with little satisfaction and less gratitude. Some years later, animated by no sympathy with the country in which he felt himself an exile, he began the publication of a series of tracts exposing the misgovernment of Ireland, the most famous of them being the *Drapier's Letters* (1724). The last of his more notable works and the greatest of all, *Gulliver's Travels*, appeared in 1726, and created an immense sensation. The closing years of his life were years of mental decay. His uncle Godwin had died insane; he had prophesied that, "like that tree," he should "die at the top," and his death in Dublin, on the 19th of October, 1745, was a long-delayed release from blank imbecility. Swift's relations with "Stella" and "Vanessa" have given rise to a small literature. The former, Esther Johnson (1681-1728), was the daughter of Sir William Temple's steward; at his invitation she, accompanied by a lady companion, followed him to Ireland, living at Trim while he was at Laracor, and at the parsonage while he was in England; and it is probable, though not demonstrable, that in 1716 he privately married her, although he never lived with her or publicly recognised her as his wife. It is certain, however, that in his strange way he was deeply attached to her, and her death left him lonely and disconsolate. Why he did not marry her, or, having married her, behaved as though he had not, will never, perhaps, be known; the most charitable and not the least reasonable theory is that he was determined not to transmit to descendants the malady which he felt to be latent in himself. Of "Vanessa," Esther Vanhomrigh (1690-1723), he became tutor in London in 1709, and acquired such influence over her that she made him an offer of marriage, which he evaded rather than refused; and there is too much ground for believing that her death, from consumption, was hastened by her discovery or suspicion of his relations with "Stella," and by his cruel resentment of her expostulations. His place in literature is not affected by these romantic episodes.

Swimming, the art or habit and action or practice of moving the body through or on water by unassisted muscular action. It is one of the most popular forms of athletic sport. The record for the mile race is 24 minutes 42½ seconds, accomplished in 1905 by D. Billington, a performance which has been characterised as marvellous.

Swinburne, ALGERNON CHARLES, poet and dramatist, was born in London on April 5th, 1837, and educated in France and at Balliol College, Oxford. His first plays, *The Queen Mother* and



ALGERNON CHARLES SWINBURNE.

(Photo : Elliott & Fry.)

Rosamond (1860), attracted little attention, but *Atalanta in Calydon* (1865), a tragedy on the Greek model, at once established his reputation. *Poems and Ballads*, published in 1866, was followed by the magnificent *Ode on the Proclamation of the French Republic* (1870) and *Songs before Sunrise* (1871), in which he gave free expression to his Revolutionary ardour. *Chastelard* (1865), *Bothwell* (1874), and *Mary Stuart* (1881) form a trilogy on the subject of Mary, Queen of Scots, whilst *Erechtheus* (1876) is a drama of the same class as *Atalanta in Calydon*, which in some respects it excels. *The Sisters*, a tragedy, was published in 1892, *Astrophel* in 1893, *The Tale of Balen* in 1896, *Rosamund* in 1899. In 1905 he essayed fiction with *Love's Cross Currents*. In his *Essays and Studies* (collected 1875), his *William Blake* (1867, 1906), *Studies of Shakespeare* (1880), *Victor Hugo* (1886) and *Ben Jonson* (1889), and various other works, Swinburne has shown himself a critic of a high order. His lyrical faculty is very remarkable; he combines fine energy with an inexhaustible flow of language and a keen sense of rhythmical beauty; indeed, it may be said that in the mastery of

musical sound he is not surpassed by any English poet.

Swindon, a town of Wiltshire, England, 21 miles N.E. of Devizes. It consists of a picturesque ancient part, Old Swindon—the Svindune of Domesday Book—and New Swindon, which is practically the creation of the Great Western Railway Company, who established their enormous works in the town in 1841. The chief buildings are Christ Church in the Decorated style, erected in 1851 from Sir Gilbert Scott's designs, the Town Hall, Corn Exchange, Municipal Buildings, Great Western Mechanics' Institute, and Victoria Hospital. Excellent building stone is quarried in the neighbourhood and interesting fossils are occasionally unearthed. The town is an important distributing centre, especially for agricultural produce. Pop. (1901), 44,996.

Swiss Guards, mercenary troops employed as the bodyguards of the kings of France and other sovereigns. The French Swiss Guards were massacred by the Revolutionists in 1789. At one time Swiss troops were the hirelings of Europe. Adapting the figure to those authors who used to fawn upon wealthy noblemen for their patronage, Robert Burns in his dedicatory lines of "The Brigs of Ayr" speaks of such poets as the "servile, mercenary Swiss of rhymes."

Switchback Railway (formerly known as "Montagnes Russes"), a line of rails along which a car or train can move by the action of gravity or momentum over downward and upward gradients alternately. This contrivance on a small scale forms an amusement at many pleasure resorts. The word "switchback" means in engineering phraseology, "backwards and forwards."

Swithin, or **Swithun**, St., succeeded Helstan as Bishop of Winchester in 852 and died in that city on July 2nd, 862. The details of his life are known only from the biography ascribed to Goscelin, a monk of the 11th century. According to this document, he became tutor to Egbert's son, Ethelwulf, and after his consecration as bishop earned the esteem of all by his piety and zeal. The popular tradition regarding the weather following St. Swithin's Day (July 15) is due to the legend that the translation of his body to the cathedral in the 10th century was delayed for 40 days by the rain.

Switzerland is a small country in the centre of Europe, bounded on the W. by France, on the N. by certain states of the German Empire, on the E. by Austria, and on the S. by Italy. It lies between 6° and 10° 30' E. and 45° 50' and 47° 50' N. Its greatest length is about 220 miles, and its greatest breadth 135 miles. Its area occupies 15,976 square miles. On the south it is traversed from south-west to north-east by the main chain of the Alps. Parallel to this, and separated from it only by the upper valley of the Rhone, is the range of the Bernese Alps. On the French frontier runs the parallel but much lower range of the Jura. Between the Bernese Alps and the Jura is the plain of Switzerland. The highest summit is Monte

Rosa (15,217 feet) and the lowest point is the northern end of Lago Maggiore (646 feet). Switzerland is composed of the upper basins of several important European rivers. On the east and the north it is drained by the Rhine; on the south-west by the Rhone; south of the main chain by the Ticino to the Po; and on the south-east by the Inn to the Danube. The areas of these river-basins within Swiss territory are in the proportion of 18, 4, 2, and 1. Switzerland consists of 22 commonwealths (cantons), of which Zug (92 square miles) is the smallest, and Graubünden (2,773 square miles) the largest. The cantons Bern, Valais, and Graubünden or Grisons contain between them nearly half of Switzerland, which, it may be interpolated, derives its name from the canton of Schwyz, the men of which were ever in the van in the gallant struggle for liberty. To the enemy it seemed to be Schwyz, Schwyz, Schwyz everywhere, and so they came to designate the people as Schwyzers, or Switzers, and their country as Switzerland. This part of Europe was in the hands of the Romans, who made roads across the Alps and settled several flourishing towns. After the fall of the Roman Empire the region was overrun by the Allemanni on the north, by the Burgundians on the south and west, and by the Ostrogoths on the south-east. Then for several centuries it was under the Frankish kings. When their power declined in the 10th century it fell partly to the Dukes of Swabia and partly to the Kings of Burgundy. In the next century it came under the German Emperors, who ruled it by various nobles, to whom privileges were granted which made them absolute masters of the districts which they administered. Some of the towns, Bern, Zürich, Lucerne, early obtained exemption from all save the Imperial authority. At the beginning of the 13th century the cantons of Schwyz, Uri, and Unterwalden were under the Habsburgs, then an unimportant family. But in 1273 Rudolph of Habsburg, who in 1283 had made his son Albert Duke of Austria, and who was also bailiff of the three lands, became emperor and king, and these, to defend their liberties, concluded the Eternal League on August 1st, 1291. In 1313 the Imperial throne was disputed by Louis of Bavaria and Frederick of Habsburg. The three cantons sided with the former, and Frederick commissioned his brother Leopold to punish them. In the attempt he was completely defeated at Morgarten on November 15th, 1315, and the supremacy of Austria was destroyed. They had still to fear her attacks, and they looked round for help. In 1332 Lucerne joined them; in 1351 Zürich; in 1352 Glarus and Zug, and in 1353 Bern. Thus allied, they were nearly independent, but they were still not united. Thirty years later the Forest Cantons were left alone to meet the attack of the Austrians, whom they completely defeated at Sempach in 1386. The legends of William Tell and Arnold von Winkelried are of late origin and now discredited. The Swiss defeated the French at St. Jacob in 1444, the Burgundians at Granson and Morat in 1476, and at Nancy in 1477. The valour of the Swiss was spread abroad, and their help was eagerly sought by the Great Powers. In 1481 Fribourg and

Soleure joined the parent cantons; in 1501 Basel, Schaffhausen, and Appenzell. In the 16th century conquests were made by the thirteen cantons both to the north and the south. These were administered (and often harshly) by bailiffs appointed by the ruling cantons. This state of things continued till 1798, when the French imposed a new constitution upon Switzerland, and the subject lands became independent cantons. After various modifications, St. Gall, Grisons, Aargau, Thurgau, Vaud, and Ticino were added in 1803, and Valais, Geneva, and Neuchatel in 1815. Owing to religious differences Basel, Unterwalden, and Appenzell have each been divided into two half-cantons—namely, Basel Stadt (14 square miles) and Basel Land (163); Unterwalden Upper or Obwalden (183) and Unterwalden Lower or Nidwalden (112), and Appenzell Exterior or Ausser Rhoden (101) and Appenzell Interior or Inner Rhoden (61). Christianity was preached in this part of Europe by monks from Ireland in the 6th century, and by the end of the 8th century most of the great monasteries were founded. In the 16th century the Reformation spread to Switzerland, and the differences between Protestants and Catholics led to many disputes and to several civil wars. In 1531 the Catholics were victorious at Kappel, and in 1712 the Protestants at Vilmergen. On both occasions toleration was guaranteed but not observed. The last struggle was in 1847, when the four Forest Cantons, with Zug, Fribourg, and Valais, were defeated by the Protestant cantons. At present the Protestants form about three-fifths and the Roman Catholics two-fifths of the population. The government of Switzerland has from the earliest times been republican. In the old cantons all business was transacted by an assembly (Landesgemeinde) which met once a year and appointed the president (Landamman), council, etc. In several cantons this meeting is still retained. Each canton manages its own internal affairs, but cannot make war or peace, form alliances, fix customs' dues, or coin money. These are in the hands of the Federal Assembly, which is composed of an upper (Ständerath, or State Council) and a lower house (Nationalrath, or National Council). To the former each canton sends two members (in the case of the divided cantons each half-canton sends one), elected either by the council or by the whole electoral body. To the National Council (167 members) there is a member to every 20,000 inhabitants. The elections are triennial, and the electoral age is 20 and over. The Federal and most of the Cantonal electorates also take a direct share in legislation by the Referendum and Initiative (a petition for a specific change in the law, signed by a certain number of electors within a given time, obliging the legislature to take a vote on the desirability of the change and legislate accordingly). The Federal executive is in the hands of the Federal Council, a committee of seven, elected by the chambers for three years. The President of the Confederation is elected for one year and is not re-eligible until the expiry of another year. He is usually but not necessarily succeeded by the Vice-President. The population in 1904 numbered 3,425,393. The chief town is Bern (70,339).

The most important commercial town is Zürich (175,033). Other important towns are Basel (124,392), Geneva (112,736), and Lausanne (51,936), St. Gall (50,625), and Lucerne (32,801). There is no regular army in Switzerland, but every able-bodied man on reaching the age of 20 has to undergo military training, and up to the age of 32 is in the first line (*Auszug-élite*), up to 44 in the second line (*Landwehr*), and up to 50 in the third line (*Landsturm*). The number of these is over 500,000, and the annual cost about 1½ million sterling. There are universities at Basel, Bern, Zürich, Geneva, Fribourg, and Lausanne, largely attended by foreign students, while elementary and secondary education are amply provided for. The greater part of the population is engaged in agricultural and pastoral pursuits, but there are some flourishing trades, as cotton-spinning, silk-weaving, watch-making, and machine-making. Up to 1830 each canton had a special costume, but these gay and picturesque dresses have since almost disappeared, except that in the Forest Cantons some of the headgear of the women and girls has been preserved. One of these caps is like the outspread tail of a turkey cock and is so large that the wearer can neither look out of window nor rest her head sidewise. When in church it screens both priest and choir from those sitting behind it. The folk of Goldau, a village overwhelmed by an avalanche of rock in 1806, were deemed the simplest in dress of the Schwyzers. The two daughters of one of the richest inhabitants, it used to be related, had only one best dress between them. When one went to Mass the other stayed at home till she came back and then put on the dress and went in her turn. The Forest Cantons cluster round the lake of Lucerne, Schwyz, and Lucerne roughly to the north, Uri and Unterwalden to the south, the lake being the common means of communication. The folk are confident, self-reliant and independent, the Uri people being so grave and conscientious that this canton has been called the conscience of Switzerland. In physique the men of the mountains are superior to the men of the valleys, though in the main all are strongly built, of medium height, and finer specimens of humanity now than formerly, since the old armour no longer fits men of average size and height. The women, generally good-looking, age rapidly, owing to hard work both in and out of doors. The disposition of the folk is frank and cheerful, the inhabitants of Lucerne town, if behind their neighbours in wealth and enterprise, being second to none in genial good-humour. Still lovers of freedom, the people are devoted to their ancient traditions, simple, brave, true and patriotic to the core. Their ancestors laid broad and deep the foundations of Swiss liberty, upholding during four centuries the banner of freedom, repelling repeated attacks on their mountain fastnesses and saving the republic from every foe. Thus to the student of history Switzerland is perhaps the most interesting country in Europe.

Ethnology. That Switzerland has been inhabited since the remotest times is evident from the numerous remains of the Stone, Bronze, and Iron ages continually turning up, especially about the

sites of the old lake-dwellings. It is no longer possible to determine the affinities of these lacustrine populations, fishers, hunters, and pastors, though the bulk of them appear to have been Celts. At least at the dawn of history, about 100 B.C., the present Switzerland was mainly occupied by Celtic peoples, such as the Helvetii of the southern, central, and north-eastern districts, the Rauraci of the Bernese Jura and left bank of the Rhine as far as Alsace, and the Sequani of the southern Jura. The Genave, whose name survives in the city of Geneva, were a branch of the Celtic Allobroges, and the neighbouring Nantuates, Veragri, and Seduni were all either pure or mixed Celts. But the Lepontii, who dwelt about the sources of the Rhone, were Ligurians, while the Rheti of the eastern districts were supposed to be immigrants from Etruria. Under the Empire all became Romanised, as did also the Burgundian Teutons, who occupied the western parts during the invasions of the barbarians; but the Allemanni, who seized all the northern districts, preserved their Teutonic speech and nationality, and later encroached largely on the Roman domain in the central and eastern cantons. Thus it is that Switzerland still continues to be divided between peoples of German and Latin speech, the former all speaking Allemannic (High German) dialects, the latter various Romance (Neo-Latin) dialects, French and Vaudois in the west, Italian in the south, Ladin or Roumansch in the east. German, dominant in fifteen cantons, is the language of two-thirds of the whole population; French is spoken in five cantons; Italian in one (Ticino) and Ladin in one (the Grisons). Amid these profound racial, religious, and linguistic differences the main bond of union is the common sense of nationality and love of freedom, fostered by long-established democratic institutions.

Swoon. [FAINTING.]

Sword, an offensive weapon for cutting and thrusting, which consists of a metal blade with one edge or two edges and a point, or of a light pointed blade with one cutting edge, and a hilt or handle with a cross-piece or plate (the pommel) and sometimes with a hand-guard. The sword-blade is divided by writers on fencing into three parts—the forte (next the hilt), the middle, and the foible. Swords vary greatly in length, from the short sword of the Romans, which was little more than a dagger, to the heavy two-handed sword or claymore; and they are either straight or curved (such as sabres and scimitars). The thrusting swords without a cutting edge are rapiers and small-swords. The sword is an attribute of justice and of royalty.

Swordfish, a fish belonging to the spiny-finned family Xiphiidae, from tropical and sub-tropical seas, and having the upper jaw produced into a stout wedge-shaped weapon, which in some instances reaches a length of nearly three and a half feet, the fish in such cases being at least ten feet long. The sword has been found embedded in the hull of ships, evidently the result of an accident or a deliberate charge. The fish is said to attack the whale with its formidable weapon. The best-known is the

Common Swordfish (*Xiphias gladius*), abundant in the Mediterranean, the warmer parts of the Atlantic and the Pacific, and sometimes straying into British waters. Swordfishes feed on herrings, mackerel, and cuttlefishes. The young forms differ greatly from the adult fish. In one species the fins are used as wings and hence this kind is known as the Flying Swordfish. [SAWFISH].

Sybaris, an ancient city of Magna Græcia, in Lower Italy, situated near the western shore of the Gulf of Tarentum (modern, Taranto), between the rivers Crathis (Crati) and its tributary the Sybaris (Coscile) and not far from their confluence. It is believed to have been the earliest of the Greek plantations in this part of Italy and to have been colonised by Achæans and Troezenians in 720 B.C. The settlement ultimately prospered greatly, but with power and wealth came a habitual display of pomp, ostentation and vanity and the inhabitants became a byword for their luxury and effeminacy, and, when attacked by a much smaller number of Crotonians, were unable to hold their own. The men of Crotona diverted the Crathis through Sybaris, completely destroying it, and the inhabitants were scattered among the neighbouring cities. This is supposed to have happened in 520 B.C. and its site cannot now be exactly determined.

Sybel, HEINRICH VON, historian, was born on December 2nd, 1817, at Düsseldorf, Germany. After leaving the gymnasium of his native town he entered the University of Berlin where for four years he studied history, being one of Von Ranke's most distinguished pupils. He became privat-docent and, in 1844, a professor at the University of Bonn and went in the same capacity to Marburg and Munich, returning to Bonn in 1861 and holding his professorship until 1875, when he was appointed Director of the Prussian Archives by Bismarck. An opponent both of the Ultramontanes and the extreme democratic party, he sat as an uncompromising Liberal in the parliaments of Hesse, the North German Confederation and Prussia. He supported the Government in their opposition to both Clericals and Socialists, but retired in 1880 disheartened by the changes in politics he attributed to universal suffrage which he had opposed. He died on August 1st, 1895, at Marburg. As a political thinker he was greatly influenced by Edmund Burke and his classical *History of Europe during the French Revolution* established his reputation as a historian. For this work he undertook long researches in the archives of Paris and proved that letters assigned to Marie Antoinette were not authentic. In addition to his *History of the First Crusade* and his study of *The Origin of Royalty in Germany*, a series of *Publications from the Prussian Archives* was started under his direction and *The Foundation of the German Empire by William I.*, which he did not live to complete, occupied his last years. For this valuable work he was allowed to use State documents of the most confidential nature, but this permission was withdrawn after the fall of Bismarck to the detriment of the last two volumes.

Sycamore, a name originally belonging to a wild fig (*Ficus Sycomorus*), but now transferred to the Great Maple (*Acer Pseudo-platanus*), which is known in the south of Scotland as the Plane. It is a native of Central Europe and was introduced into England, where it sows itself freely, in the 14th century. It forms a tree sometimes 60 feet high, with smooth, deciduous bark; pairs of large, dull-green, palmately five-lobed leaves, glaucous on their under surfaces; pendulous racemes of green, polygamous flowers; and double samaras with scimitar-shaped wings. The wood is white, and is largely used in turnery, for bread-platters, etc., and for toys. It is a valuable fuel and makes excellent charcoal. Sugar can be prepared from the spring sap, and the tree is often very valuable for its shade.

Sycosis. [RINGWORM.]

Sydenham, a southern suburb of London, in the parish of Lewisham. It is well known on account of the Crystal Palace (which is situated, however, in the adjacent parish of Lambeth) upon Sydenham Hill, which was constructed of the materials used for the building of the Great International Exhibition held in Hyde Park in 1851 and was opened on June 15th, 1854. The Palace commands a splendid prospect of Kent and is a landmark for miles in every direction. The multiplication of amusements in London itself seriously affected the prosperity of the Palace, but since 1890, when Dr. W. G. Grace (b. 1848), the celebrated cricketer, was appointed manager of the Athletic department, it has become the venue of the final round for the English Football Association's Cup, and the headquarters of the London County Cricket and Bowling Clubs and the Crystal Palace Football Club, while ample facilities exist for polo and cycling matches. The concerts at the Crystal Palace justly acquired a great reputation under the conductorship of Sir August Manns (1825-1907) and the Triennial Handel Festivals attract enormous crowds from all parts of the kingdom. The pyrotechnic displays are one of the features of the summer season. Sydenham was formerly resorted to for its medicinal waters, which were in vogue for about 150 years from the middle of the 17th century. It is said that George III. once spent the better part of a day in drinking them, the cottage in which his Majesty rested being surrounded meanwhile by a cordon of Life Guards. Sydenham was for several years the home of Thomas Campbell, who here wrote *Gertrude of Wyoming* and *The Battle of the Baltic*, of Thomas Dermody (1775-1802), a hapless son of the Muses who was nobody's enemy but his own, and Thomas Hill (1760-1840), the alleged original of "Paul Pry."

Sydenham, FLOYER, translator, was born in Devonshire, England, in 1710 and educated at Wadham College, Oxford. He was called to the bar in 1735 and afterwards took holy orders, being presented to the rectory of Esher in 1744, an appointment he resigned three years later. Being an admirable Greek scholar he determined to undertake the translation of Plato, and accomplished

this task between 1759 and 1780. Unable to pay a small debt, he was thrown into prison in London, where he died on April 1st, 1787. The sympathy excited by his fate resulted in the formation in 1790 of the Literary Fund for the assistance of poor authors.

Sydenham, THOMAS, physician, was born at Wynford Eagle, Dorsetshire, England, on September 10th, 1624, and was educated at Magdalen Hall, Oxford. His studies were interrupted by the Civil War, in which he took an active part on the side of the Parliamentary forces. His studies were resumed at Wadham College in 1647 and he was elected a Fellow of All Souls' two years afterwards. A medical degree was conferred upon him by command of the Earl of Pembroke, Chancellor of the University, in 1648, before he had acquired any medical knowledge. Accordingly he proceeded to make good this defect at Oxford and Montpellier,

and capacious harbour of Port Jackson (named by Captain Cook in 1770 after Sir George Jackson, second Secretary to the Admiralty). Captain Arthur Phillip, afterwards the first Governor of New South Wales, arrived at Botany Bay in 1788 with the first batch of convicts for the purpose of forming a settlement, but, dissatisfied with the site, he proceeded six miles farther north, where he found on the southern shore of Port Jackson an ideal site. Accordingly on January 26th, 1788, he founded a city which he christened Sydney after Thomas Townshend (1733-1800), 1st Viscount Sydney, Secretary of State. It was erected into a bishopric in 1836, incorporated as a city in 1842, benefited greatly by the discoveries of gold in 1851, and still more by the abolition of transportation in 1853. Since the middle of the 19th century its prosperity has advanced by leaps and bounds. It occupies a magnificent frontage on the harbour, the shores of which are indented by a number of



SYDNEY HARBOUR FROM THE DOMAIN.

and by 1663 was in full practice in London, where he died on December 29th, 1689. Abandoning the "chemical" and "mathematical" theories of his day, he made it his object to study the symptoms and constitution of each patient who came under his care, and he guided by his own observation and experience. He was consequently regarded with but small favour by the College of Physicians, but his treatment was uniformly successful, and he enjoyed the esteem of John Locke, Robert Boyle, and other eminent men. His description of gout (*Tractatus de Podagra et Ilydrope*, 1685) is still a classic account, and among his books were *Methodus Curandi Febres* (1666), afterwards enlarged to *Observationes Medicæ* (1676) and those dealing with Epidemics and Venereal Diseases (1680), and Confluent Small-pox (1682), and several others, some still in manuscript.

Sydney, the capital of New South Wales and the oldest city in Australia, situated on the beautiful

beautiful bays, including Black Wattle Cove, Darling Harbour, Sydney Cove, Farm Cove, Woolloomooloo Bay, Elizabeth Bay, and Rushcutter's Bay, while the ocean is five miles distant on the east. Amongst the parks and open spaces are Wentworth Park, Prince Alfred Park, Moore Park, Centennial Park, Hyde Park and the Domain and Botanical Gardens, the last-named of remarkable beauty, while the cricket ground affords one of the finest pitches in the world. Amongst the more notable buildings are Government House, the Town Hall, St. Andrew's Cathedral (Anglican) in George Street, a superb thoroughfare, St. Mary's Cathedral (Catholic), the Royal Mint, the University, with the finest hall in Australasia, the National Art Gallery and numerous charitable and educational institutions. The city is well situated as regards the coalfield of the state and excellent building stone exists, so to speak, at its doors. The industries include the making of locomotives and railway plant, of vehicles of every description,

tanning, meat-preserving, saddlery, bootmaking, and the manufacture of clothing, flour, paper, tobacco, sugar, glass and pottery, besides brewing, distilling, and the repairing and building of ships. The traffic of the port and in connection with the pastoral and mining concerns of the interior employs a large number of people. The community is pleasure-loving, horse-racing, cricket, boating, and bowls finding enthusiastic adherents. Pop. (1901), 481,830.

Syene. [ASSOUAN.]

Syenite, a name formerly applied by some geologists to that hornblende variety of granite which occurs at Assouan, the ancient Syene, where Cleopatra's Needle (now standing on the Thames Embankment in London) and the sister obelisks were quarried. It is now applied to a plutonic, distinctly crystalline rock, composed chiefly of flesh-coloured orthoclase and black hornblende, but containing some plagioclase and some quartz, occurring typically in the Plauenscher-Grund of Dresden. Syenite contains about 60 per cent. of silica, and has a specific gravity of from 2.75 to 2.9, so that it is an intermediate rock.

Syllogism, in logic, is, according to Archbishop Whately (1787-1863), an argument expressed in strict logical form, so that its conclusiveness is manifest from the structure of the expression alone. The formula consists of two premises and a conclusion alleged to follow from them in which a term contained in both premises disappears, but the truth neither of premises nor conclusion is necessarily asserted. Dr. Johnson's illustration was "Every man thinks; Peter is a man; therefore Peter thinks."

Sylph, in the system of Paracelsus, an imaginary spirit of the air. Sylphs were of the male sex, and resembled men in appearance, and in all other respects, except that they possessed no soul. It was considered possible that they should intermarry with the daughters of men, and the offspring of such unions belonged to the mother's race, not to the father's. Alexander Pope introduced sylphs into his *Rape of the Lock*, and probably brought the term into general use, though it is now usually applied to a graceful girl or young woman.

Sylviculture, that division of the science of forestry which relates to the planting and cultivation of collective bodies of forest-trees. Its first fundamental principle is that the natural productive capacity of the soil must be carefully conserved, in order that it may satisfy continuously and uninterruptedly all rational demands made on the land with regard to the production of timber, or of other forest crops. Its second principle is to select for planting the trees most suitable to the climate, soil and situation to be planted, due regard being paid to the commercial value of the produce. The application of the principles of meteorology, geology, and vegetable physiology to the problems of nutrition, growth and reproduction in trees belongs thus both to arboriculture,

the study of trees individually, and to sylviculture. So, too, the protection of whole woodlands from injurious climatic influences, insects, fungi, etc., belongs to sylviculture, as the treatment of the individual tree in such matters does to arboriculture. Sylviculture is not directly concerned with the sale of forest produce; but it is most pressingly interested in the truly economical management and realisation of this produce. A third leading principle may be said to be that the annual felling of mature timber should not exceed the annual production of the forest. To cut less is to neglect economy of management; to cut more is to trench upon the capital of the forest. This involves the use of a proper working-plan, and systematic forest book-keeping. Among the most important practical results of the long and careful study of sylviculture in Germany is the conclusion that mixed forest—i.e., the cultivation of several species together—is preferable to pure forest, or the growth of species singly, and the principle that trees should be planted and thinned in such a manner as to maintain close canopy, or unbroken shade beneath them.

Symbiosis, a term originally employed by Heinrich Anton De Bary (1831-88) in 1879, for cases in which organisms of distinct species live together in such a condition of consortism or commensalism as to benefit both, in opposition to parasitism, in which the advantage is all on one side. Etymologically, however, and perhaps as a matter of convenience, it might be well to expand the connotation of the term to include all forms of organic association—e.g., socialism, or the association of numerous individuals of one species, mutualism and parasitism, especially as the two last-named seem connected by numerous intermediate cases. The two most striking instances of mutualist symbiosis are the alga-fungus association first pointed out by Simon Schwendener in 1868 in the cases of lichens, and the algal yellow-cells within the bodies of Radiolaria detected by Ernst Heinrich Haeckel in 1870, and explained by Patrick Geddes in 1882. It is important to notice in the former case that the mutualist community of alga and fungus constituting the lichen can live in situations where neither can exist separately. In the latter case Geddes showed that the yellow cells had cellulose walls, were coloured by diatomins, evolved oxygen and formed starch when in sunlight, and absorbed carbon dioxide and nitrogenous waste substances from the animal's body, thus performing both respiratory and quasi-renal functions for it and being nourished in return. He concludes "for a vegetable cell no more ideal existence can be imagined than that within the body of an animal cell of sufficient active vitality to manure it with abundance of carbonic anhydride and nitrogenous waste, yet of sufficient transparency to allow the free entrance of the necessary light. And, conversely, for an animal cell there can be no more ideal existence than to contain a sufficient number of vegetable cells, constantly removing its waste products, supplying it with oxygen and starch, and being digestible after death."

Syme, JAMES, surgeon, second son of John Syme, a lawyer, was born on November 7th, 1799, in Edinburgh and was educated at the Royal High School. His youthful interest in anatomy and chemical research led to the discovery, in his seventeenth year, of a method of making cloth waterproof by the application of caoutchouc dissolved in coal-tar naphtha, afterwards patented by Charles Macintosh of Glasgow. He became a pupil of John Barclay at Edinburgh University and, in 1818, was appointed anatomical demonstrator by Robert Liston. On the latter's retirement in 1823, having continued his studies in Paris and in Germany, Syme started a course of lectures on anatomy, but afterwards devoted himself to surgery. On being refused an appointment at Edinburgh Infirmary he established a private surgical hospital at Minto House, where he began the system of instruction which rendered his teaching illustrious. He was appointed professor of clinical surgery in Edinburgh University in 1833. The authorities of the Infirmary were obliged to admit him as a lecturer and Liston's departure for London left Syme without a rival in the north. When Liston died he was invited to succeed him in University College, London, and in February, 1848, entered upon his duties, but not being satisfied with the conditions of the appointment returned to Edinburgh in July and resumed the professorship which was still vacant. In 1868 Thomas Carlyle underwent an operation at his hands. He was twice married and died on June 26th, 1870. The improvements he introduced and the instruments and appliances he devised are but a part of his many services. His principal writings include treatises on *Diseases of the Rectum*, *Stricture of the Urethra*, *The Excision of Diseased Joints* and *The Pathology and Practice of Surgery*.

Symington, WILLIAM, one of the inventors of steam navigation, was born at Leadhills, Dumfriesshire, in October, 1763. After having studied at Glasgow and Edinburgh Universities he abandoned the idea of becoming a minister in favour of civil engineering. In 1786 he and his brother made a working model of a steam road-carriage, and in the following year he took out a patent for an improved form of steam-engine, obtaining the rotary motion by using chains and ratchet wheels. A retired Edinburgh banker, Patrick Miller, had made several experiments of boats driven by paddle wheels, worked by manual power, on a lake on his estate of Dalswinton. James Taylor, tutor to Miller's sons, suggested that Symington should be employed to design a steam-engine in place of the manual power. On October 14th, 1788, in the presence of Miller's friend Robert Burns and others, the boat, 25 ft. long by 7 ft. broad, was successfully propelled on the lake at the rate of five miles an hour. Miller decided to try a more powerful vessel on the Forth and Clyde Canal and it was tested in November, 1789, the speed then attained being seven miles an hour. Symington's means did not admit of his continuing the experiments, and he was not able to resume his attempts until 1802, when the *Charlotte Dundas*, "the first practically successful steamboat ever built," towed

two barges, each of 70 tons burden, on the canal $19\frac{1}{2}$ miles against a head wind in six hours. Nevertheless the owners of the canal decided against the adoption of Symington's invention, fearing damage to the banks from the wash caused by the paddles, and the *Charlotte Dundas* was beached and broken up. The Duke of Bridgewater, however, realised the importance of the invention, and ordered eight boats of a similar design. Unfortunately his Grace died in March, 1803, and the order was cancelled. The disheartened inventor came to London. He received two grants from the privy purse in recognition of his services to the cause of steam navigation, and a small grant from the London steamboat proprietors, but failed to obtain further encouragement or any annuity. He died on March 22nd, 1831, and the engine he made for the equally unfortunate Miller is now in the Victoria and Albert Museum at South Kensington.

Symmetry. Two objects which are related to each other, as the right hand is to the left, are said to be symmetrical. The one is, in fact, the image of the other. In the case of the two hands the symmetry is, of course, not faultless; but we can take any object we like and place it in front of a plane mirror, and we shall see behind the mirror an object exactly the reverse of the real one in front. Every point or line in the object has its representative in the image, and the two corresponding details are at the same distance from the reflecting surface. This surface is therefore a plane of symmetry. In considering a cube carefully we notice that there are several methods of dividing it into two symmetrical parts. There are, in fact, nine such methods, and the dividing planes are the nine planes of symmetry possessed by a cube. An octahedron, however, has the same number of planes of symmetry, while a hexagonal prism has seven. In no science, perhaps, does symmetry play so important a part as in that branch of mineralogy known as crystallography. Crystals are divided into families, according as they possess this characteristic in a greater or less degree. [CRYSTALLOGRAPHY.] A sphere is a solid possessing an infinite number of planes of symmetry. Any plane passing through its centre divides it into two exactly equal and similar parts. If we are dealing with plane figures, the circle possesses greatest symmetry. Any diameter is an axis of symmetry dividing the circle into two halves, of which each is the image of the other. An ordinary isosceles triangle has one axis of symmetry—the line through the apex bisecting the base. This is multiplied by three when the isosceles is specialised into an equilateral triangle.

Symonds, JOHN ADDINGTON, man of letters, was born at Bristol, England, on October 5th, 1840, and educated at Harrow and Balliol College, Oxford. He had hardly completed a brilliant career at the University when symptoms of lung disease became evident, which debarred him from the pursuit of an active profession. For a few years he settled at Clifton, but the pulmonary complaint growing worse he made his home at Davos Platz in Switzerland—the merits of which resort for patients afflicted with

phthisis he did much to make known—in 1877 and practically resided there till his death at Rome on April 19th, 1893. His *Renaissance in Italy* (7 volumes, 1875-86) is a monument of profound knowledge and literary insight. He also published *Studies of the Greek Poets* (1875-6), *Shakespeare's Predecessors in the English Drama* (1884), *Shelley and Sidney* in the "English Men of Letters" series, a masterly translation of the *Autobiography of Benvenuto Cellini* (1887), the *Autobiography of Count Carlo Gozzi* (1890), and the *Life of Michelangelo Buonarroti* (1892), besides *Many Moods* (1878), *Wine, Women and Song* (1884) and other volumes of verse.

Symphony, a musical composition in three or more movements for an orchestra. This most classical form of instrumental music was first developed by Haydn, and has been carried further by Mozart, Beethoven, Schubert, Spohr, Schumann, Mendelssohn, Berlioz, Rubinstein, Raff, Brahms, Tchaikovsky, Richard Strauss and other masters. In form the symphony is based on the sonata.

Sympodium, a type of branching in which at each bifurcation one branch develops more vigorously than the other, so that the successive strong-growing branches form a pseud-axis, on which the weaker branches appear to be lateral outgrowths. Sympodia are of four kinds:

- I. In one plane, forming a bilateral system.
 - A. The Rhipidium or fan, with the branches alternately in opposite directions.
 - B. The Drepanium or sickle, with the branches all to one side.
- II. In different planes forming a radial system.
 - C. The Cicinnus, with the branches alternately in opposite directions.
 - D. The Diostryx, with the branches all to one side.

Synagogue, the place of meeting of a Jewish congregation for worship and instruction, under the control of a board of elders, whose president is the "ruler of the synagogue." The term (Greek, *synagōgē*, "a bringing together") was primarily applied to the congregation and its meetings. Its origin probably dates from the Exile (720 B.C.) when the Jews, strangers in a strange land, felt the need of assembling themselves together for prayer, meditation, and the study of the Law. At one period the synagogue exercised judicial functions in virtue of which the Court (composed of 23 members in larger towns and of 7 in smaller) had power to indict punishment, the methods of which were scourging (39 stripes inflicted in the building by the attendant), excommunication and death (the last two impossible only by the larger council of 23 members). Of course such functions have long ceased to be civilly legal or tolerable.

Syncarpous, having several carpels united together. The union may vary in extent, from the slight union of the lower halves of the ovarian regions of the two carpels in the saxifrage, to the complete fusion in the ovarian, stylar, and stigmatic region in the Primulaceæ. Very often the number

of the carpels remains apparent, either in the external lobing of the ovary, as in the lily; or in the number of chambers or of placentas, as in St. John's wort and the violet respectively; or in distinct styles, as in grasses; or in stigmatic lobes, as in the Compositæ. The great majority of angiosperms have syncarpous gynæcia.

Synclinal, or trough, a downward fold in a series of strata, or, technically, when two portions of one or more strata are so folded as to dip from opposite directions towards a central depressed axis. This axis will necessarily be the line of strike. Owing to the compression along this line on the upper surface of beds thus folded, the synclinal is a durable form, resisting denudation; and many mountains and hills, such as Snowdon, have this structure. All the British coal-fields are preserved in synclinal folds, and such folds are essential in the sinking of artesian wells.

Syncope. [PAINTING.]

Synergids, in botany, the two cells situated at the apex of the embryo-sac.

Synesius, bishop, a native of Cyrene (the modern Ghrennah, Barca, on the Mediterranean), flourished at the beginning of the 5th Christian century, being born probably about 375. Whilst still a youth he became a disciple of Hypatia at Alexandria, and continued to hold Neoplatonic views almost to the close of his life. In 410 he was consecrated Bishop of Ptolemais (modern Barca) in spite of his own scruples respecting his orthodoxy. The date of his death is not known, but it is conjectured to have taken place not later than 414. His works include an oration *De Regno* (delivered during an embassy to Arcadius at Constantinople in 399), a treatise *De Providentia*, letters, and some remarkable Hymns.

Synovitis. [JOINT.]

Syntonin, an albuminoid or proteid material, formed by the action of dilute acids upon many other proteids. It is a white solid, insoluble in water, but may be dissolved by acids or alkaline liquids.

Syphilis, a contagious disorder transmitted by direct inoculation, which presents in many respects resemblances to the "exanthemata," but differs from this group of maladies in its long period of latency, in the length of time during which the early specific eruptions may appear, and in the extended period throughout which the later manifestations of the disease may be developed. The first indication of the disease is the occurrence, usually about four weeks after inoculation of the contagion, of a small papule, which gradually extends, with induration of the surrounding skin, until it attains its full development at the end of about six weeks. This is the hard or Hunterian chancre. Shortly after its appearance the neighbouring lymphatic glands—that is to say, usually those of the groin—become enlarged and indurated. These phenomena constitute what are known as the primary symptoms of the disease. After the lapse of about two months from the time of inocu-

lation, the secondary symptoms appear. These consist of febrile disturbance, cutaneous eruptions of variable character, and affection of the mucous membrane of the throat; what are known as mucous tubercles are sometimes developed, and occasionally joint affections, periostitis, iritis and other eye troubles appear. Still later, and usually after the lapse of about a year, but it may be after a much longer interval of time, tertiary symptoms are apt to occur. These may involve the skin (producing tubercular or scaly eruptions) or the mucous membranes (whether of the throat, tongue, larynx, or other parts), or may involve the muscles, bones, or viscera (including among the latter the brain and other nervous structures). These tertiary phenomena are usually attended by a peculiar overgrowth of tissue, resulting in the formation of what are known as gummata. Tertiary lesions are generally distributed unsymmetrically, and have a marked tendency to recur. Syphilis is a common cause of abortion and still-birth, and the children of syphilitic parents sometimes present certain characteristic symptoms which constitute the phenomena of the disease known as "inherited syphilis." These consist mainly of "snuffles," skin eruptions, and the development of mucous tubercles in infant life, while later characteristic phenomena are flattening of the bridge of the nose, a peculiar malformation of the permanent incisor teeth, and interstitial keratitis. The treatment of syphilis mainly consists in the administration of mercury, the "mercurial course" being continued with careful regulation over a considerable period of time; and in the treatment of the later phenomena iodide of potassium has been largely employed. Having regard to the possible serious complications no attempt should be made to treat cases privately and in no circumstances whatever should resort be had to the numerous quacks who play upon the susceptibilities of the young and unwary and who are far more interested in retaining a patient than in effecting a cure. The only wise course is to consult the family doctor, or other properly-qualified medical man, upon the appearance of symptoms.

Syracuse, now **SIRACUSA**, the chief city of ancient Sicily, situated on the south-eastern shore of the island. It was colonised about 735 B.C. by Corinthians, who first settled on the islet of Ortygia, which was separated from the coast by a narrow channel and is renowned as containing the fountain of Arethusa, the waters of which still bubble up clear and sparkling though no longer drinkable since the earthquake of 1170 allowed the sea water to mingle with them. In time the Syracusans waxed strong and prosperous, the community being at one time under a democratic and at another under a tyrannic government. The most celebrated tyrants were Gelon, who in 485 restored the authority of the oligarchy; Hiero (478-467), an enlightened patron of poets and philosopher, but a grasping and cruel ruler; Dionysius the Elder (405-367), who built the docks and fortifications, and Timoleon (343-337), who delivered the citizens from the despotism of the worthless Dionysius the Younger, who might have gained credit had he

listened to the sage counsels of Dion, the friend and disciple of Plato, instead of banishing him. The Athenians besieged the city in vain in 414 after a prolonged assault, and it underwent a siege at the hands of the Romans in 215-212, falling in the last of these years, in spite of the efforts of the famous engineer, Archimedes, who was a native. Under the Romans Syracuse very gradually declined; it was no more to them than any other outlying city which they had reduced by force. Ultimately it was destroyed by the Saracens in 878 and since that event the mainland portion of the original city has not been rebuilt. The present town, occupying only the peninsula of Ortygia, has a good harbour, deep and large, is fortified, has narrow, crooked streets, lighted by electricity, and the cathedral of Santa Maria delle Colonne (the ancient temple of Minerva). Among the relics of the old city are a large amphitheatre, the extensive catacombs, and the Ear of Dionysius, which forms a cavern 170 feet long, 35 feet wide, and 60 feet high, and possesses a wonderful echo. The manufactures include pottery, chemicals and drugs, and there is a brisk trade in wine, oil, and fruit. Pop. (1901), 32,030.

Syracuse, capital of Onondaga county, New York State, United States, situated at the southern end of Lake Onondaga, 148 miles W. by N. of Albany. The principal structures are the Federal building, town hall, court-house, the cathedrals of St. Paul and St. John, Museum of the Fine Arts, Holden Observatory, Syracuse University (including Crouse Memorial Hall) and several educational and charitable institutions. The manufactures comprise salt (from the deposits discovered on the lake shores by the French Jesuit missionaries in 1654), soda ash, chemicals, iron and steel, machine-shop products, engineering, motor-cars, typewriters, electrical appliances, textiles and agricultural implements. Pop. (1900), 108,374.

Syr-Daria. [JAXARTES.]

Syria, a country in the south-west of Asia, forming a vilayet or province of the Turkish Empire. It extends along the eastern coast of the Mediterranean, from the Taurus range in the N. to Egypt and Arabia on the S., and has the Euphrates and the Syrian desert on the E. It occupies an area of 114,530 square miles. On the coast are some low sandy tracts, but it is generally precipitous, rising in Mount Carmel to 3,000 feet. [The portion of country between Libanus and the Sinai Peninsula is described under PALESTINE.] The peak of Hermon, or Jebel-esh-Sheikh, at the southern extremity of Anti-Libanus, 30 miles west of Damascus, is 9,050 feet high and covered with snow during the greater part of the year. The principal rivers are the Euphrates and Jordan, and the rivers that water Damascus. The valley between Libanus and Anti-Libanus was called Coele (hollow) Syria. The climate of the mountains is good, but the coast is unhealthy. The valleys of Libanus are very fertile, and produce corn, cotton, fruit, indigo, grapes, sugar canes, mulberries, olives, tobacco, and there are forests of oaks, pines and

cypresses, but the cedars of Lebanon are only a remnant. Game is plentiful and the domestic animals include the camel, ox, goat, sheep, mule, ass, horse. Bee-keeping is largely pursued. Iron and some coal have been found. Trade is in a languishing state, though Damascus still manufactures silk and swords, and some silk is made at Aleppo and Beyrout. The last of these towns is the only port of any commercial consequence. The inhabitants number 2,890,000, and consist of Syrians, Arabs, Turks, Greeks, and Jews, besides nomad Turkomans, Kurds, and Bedouins. The mountaineers are Druses and the Christian Maronites. Their quarrels led to the intervention of the Western Powers in 1861. Historically, Syria possesses deep interest, since so much of it was the *scène* of incidents in the Bible. The Phœnicians on the coast were the first people to acquire power. Then in the 10th century B.C. the Hebrew kingdoms of Israel and Judah became predominant. With the conquests of the Assyrians the kingdom of Israel was extinguished and the country was known as Assyria or Syria. About 586 B.C. the Babylonians destroyed Judah. Persia superseded the sway of Babylonia and then a large part of Syria was annexed by Alexander the Great. On the break-up of the Macedonian empire Antioch grew a Greek centre of light and leading. Next came the period of Roman rule, followed in the 4th century by that of the Byzantine Emperors who, three centuries later, made way for the Saracens. The Crusaders vindicated a militant type of Christianity and founded the kingdom of Jerusalem in 1099. At the end of the 12th century this kingdom was abolished and since 1516 Syria has formed a part of the Sultan's dominions.

Syrian Bear (*Ursus syriacus*), a light-coloured form of the Brown Bear, from Western Asia. It is the bear of which we have the oldest historical record, since it was a creature of this species that David slew, while two females of the same kind attacked the mockers of Elisha and killed forty-two of them, as narrated in 2 Kings ii. 23, 24.

Syringe is an extremely simple form of pump. It consists of a cylinder ending in a nozzle and containing an air-tight piston. If the nozzle be placed in some liquid and the piston be pulled outwards, liquid is forced into the cylinder by atmospheric pressure. On withdrawing the syringe and pushing the piston inwards the liquid is forced out from the nozzle.

Syzygy is the conjunction of earth, sun, and moon; hence the moon is said to be in syzygy when new or full.

Szechwan, or SZECHUEN, a province in Western China, occupying 218,480 square miles. It has Tibet to the N.W. and Yunnan to the S.W., and is watered by the Yang-tse-Kiang and its tributaries. The province is generally hilly, and in the west mountainous. The principal crops are all kinds of cereals, tea, sugar, tobacco, oil-seeds and rhubarb. The mineral wealth includes iron, copper and coal, and amongst the industries the manufacture of silk of high-class quality is the most

important. Cheng-tu is the capital, but Chungking the chief commercial town. This was opened to British trade in 1889. Pop. (estimated), 68,724,890.

Szeged, a town of Hungary, on the right bank of the Theiss, 100 miles S.E. of Budapest. It consists of the town proper, almost destroyed by flood in 1879; the fortress, approached by two bridges, having walls, ditches, and a garrison, a church and prison; the upper suburb, containing a church and a salt magazine; the lower suburb, containing a Franciscan monastery, church and hospital; and the corn market, where are the town house, barracks, cloth and tobacco factories, etc. Some barge-building is carried on, and the chief products are tobacco, salt, wood, wool, cotton, corn and cattle. Pop. (1900), 102,991.

T

T, the twentieth letter of the English alphabet, is derived from the Greek *tau*, which was in all respects equivalent to the Semitic letter of the same name. It is the hard or voiceless dental mute (whereas *d* is soft or voiced), and is produced by the contact of the tip of the tongue with the teeth (as in French), or the gum behind the teeth (as in English), or the tip of the tongue may be bent back against the palate, in which case the sound is called "cerebral." In point of fact, however, though called a dental sound, the teeth play no part in its production, and it would more correctly be designated a lingual or tongue-tip sound. The nasal analogue is *n*. The dental or lingual sounds are commoner elements of speech than either the palatal or labial. The value of the letter has practically remained unaltered since its introduction. The *th* sounds were represented by special characters in the Anglo-Saxon alphabet—namely, *þ* and *ð*—but these were ousted by the Latin digraph *th*, which occurs in two sounds—the soft-open or sonant, as in "this" and "breathe," and the sord, as in "thin" and "breath."

Tabasheer, or TABACHIR, the Indian name for the remarkable silicious secretion formed in the joints of old bamboo stems. It is an amorphous hydrated silica or opal; but is supposed in India to possess medicinal virtues. It is of a bluish-white colour, and has a pearly lustre. It is supposed to be due to disease or injury to the plant. It is able to absorb its own weight of water and when saturated it becomes entirely transparent.

Tabes Dorsalis. [LOCOMOTOR ATAXIA.]

Tabes Mesenterica, a term sometimes applied to a wasting disease usually affecting children, and associated with tubercular deposit in the mesenteric glands of the stomach. All the fatty portion of food has to pass through these glands after digestion and, should they become diseased, this function will be impossible and rapid and extreme wasting of the body will ensue. Along with this diseased state there is

usually tubercular ulceration of the bowels; so that if diarrhoea, marked wasting and hectic fever occur together mesenteric disease should be suspected and the doctor called in. He may be able to feel the mass of enlarged glands at the back of the abdomen. The treatment must include fresh air, nutritious food and healthy surroundings, but attention must be paid to the diet particularly, in order that little solid residue shall be left to pass over the sore part of the bowel. Eggs, fish, meat, fats and milk are far better than starchy foods and the use of any article found to disagree must be discontinued at once. [MESENTERY.]

Tabriz, capital of the province of Azerbaijan, Persia, on the Aji, which flows into Lake Urumiah, 35 miles E. of the town. There is an extensive citadel of brick, which shows marks of earthquakes. Tabriz has still a considerable transit trade, though its importance in this respect has been diminished by the construction of Russian railways. The line of Anglo-Indian telegraphs passes through the town. The ruins of the Blue Mosque (1450) are partly ornamented with blue tiles in arabesque. The chief industries are in leather and silk, and the gold and silver work is of great excellence. The imports consist mostly of cotton and woollen goods, wines, spirits and sugar; and the exports of raw silk, carpets, shawls, drugs, spices and dried fruits; and there is a good deal of smuggling. The town (anciently *Tauris*) was in A.D. 297 the capital of Tiridates II., King of Armenia, and was enlarged in 791 by Zobeideh, the wife of the Caliph Haroun Alraschid. It has often been besieged, and has suffered much from earthquakes. Pop. (estimated), 200,000.

Tabulata, a term once used as the name for a group of corals characterised by the fact that the body chambers or 'loculi' are crossed by horizontal plates known as tabulae. These are most common in the corals of the Palaeozoic rocks. It is now, however, known that these tabulae are merely supporting structures developed quite independently in different groups of corals in which the soft parts of the animal require some support below. The old group of Tabulata is therefore split up. Some, such as the living Blue Coral, or Heliopora, and Halysites, or the Chain Coral, are assigned to the Alcyonaria; others, such as the fossil Favosites, to the Perforata, while the majority, including the Cyathophylloidea, Zaphrentoidea, and Cystiphyllioidea, go to the Aporosa.

Tacamahac, an oleo-resin, fragrant in smell, employed in ointments for ulcers and occasionally used for incense. It is secreted by various trees. East Indian tacamahac, the product of *Calophyllum inophyllum* and *C. Calaba*, is yellowish and acidulous and has a lavender-like smell. Brazilian tacamahac is the product of *Icica Tacamahaca* and *Elaphrium tomentosum*, and is light-brown, opaque and bitter. In Canada and the Northern United States the name is applied to the balsam exuded from the buds of the balsam-poplar (*Populus balsamifera*), formerly imported into Europe as "baume focot," a kind of balm.

Tacitus, CAIUS CORNELIUS, the eminent Roman historian, was born about A.D. 54. The details of his life must be gathered mainly from allusions in his own works and the letters of Pliny the Younger. He is supposed to have been the son of Cornelius Tacitus, procurator of Gallia Belgica, who belonged to a family of equestrian rank. Whilst still young he acquired celebrity by his eloquence as a pleader. In 78 he married the daughter of Cnaeus Julius Agricola, who was about to begin his brilliant career in Britain. Appointed quaestor by Vespasian in 79, the historian passed through the office of aedile or tribune to that of praetor (88) under Domitian, and in 97, during the reign of Nerva, was made consul suffectus. Two years later he and Pliny were engaged in the prosecution of the infamous Marius Priscus, who had been proconsul of Africa. This is the last event in his life of which we have any record. It is probable that he died about 117. The surviving works of Tacitus are a dialogue, *De Oratoribus*; a life of his father-in-law, Agricola (an extremely picturesque and interesting piece of biography); a treatise, *De Situ Moribus et Populis Germaniae* (the earliest source of information concerning the Teutons and the races nearest akin to them); and two historical works of the first importance—the *Historiae*, extending from A.D. 68 to 96 (of which we possess four books and part of a fifth), and the *Annales*, from 14 to 68 (comprising sixteen books, of which eight are still complete, and fragments of four others remain). The two latter works, which give a terrible picture of the decay of imperial Rome, are marked by the utmost compression, abruptness and vigour of style; but at the same time the language is ornate and noble sentiments find their just expression in eloquent and sonorous periods. The occasional obscurity is probably intentional, the author's design being to attack the vice and political corruption of the time without endangering his own liberty or life. His fairness, however, has been much disputed, especially with reference to the treatment of Tiberius in the *Annales*.

Tacoma, a seaport and the capital of Pierce county, Washington State, United States, on the eastern side of Puget Sound, 80 miles from the Pacific and 23 miles S. by W. of Seattle. But a comparatively small village in 1880 it has already attained considerable prosperity and importance. It occupies a situation of remarkable beauty, commanding a splendid view of Mount Rainier (14,526 feet) away to the south-east. The principal buildings are the town hall, court-house, Ferry Museum of Art, University of Puget Sound, Whitworth College, Pacific Lutheran University, Annie Wright Seminary and several charitable institutions. The industries comprise lumbering, iron and steel, flour-milling, brewing and the making of cars and boilers, and there is a brisk trade with Japan in tea, coal, iron and timber. Pop. (1900), 37,714.

Tactics, the movements and disposition of troops adopted by contending forces when they are face to face and desire to gain some immediate advantage. The sphere of tactics must not be

confused with that of strategy, which is concerned with the general conduct of a campaign rather than with its details at any one time or spot. A distinction is made between various kinds of tactics, according to the character and extent of the operations, the troops employed, and other circumstances. Thus grand tactics and manœuvre tactics deal with those comprehensive movements on which hangs the fate of great battles, whilst minor tactics relate to outposts, reconnaissance, the action of advanced and rear guards, and other operations on a small scale. So again there are tactics of cavalry, infantry, and artillery, combined tactics, siege tactics, and mining tactics. In naval, as in military, warfare there is a broad distinction between tactics and strategy. Naval tactics are concerned with the management of ships and fleets during an action, whereas the aim of naval strategy is to obtain and keep the command of the sea. The battle of Salamis (480 B.C.) is an ancient example of the skilful employment of tactics according to recognised rules. At an early date it had become an accepted principle that force should be concentrated against some point of the enemy's fleet, which would then serve as a "basis of operations." The advantage of obtaining the weather-gage, so as to facilitate the boarding of the enemy's ships, was also fully appreciated. But the modern "line-of-battle" dates only from the war between England and Holland during the Commonwealth and the reign of Charles II., when it was introduced into both navies. It is said that the original purpose of the line-of-battle composed of ships drawn up either abreast or one behind another, so as to afford mutual assistance at the shortest notice, was to avert the havoc wrought by fire-ships. The manœuvre of breaking the enemy's line by cutting through it was carried out with the utmost skill by Lord Rodney in 1782. In several of Nelson's great battles, notably in that of Trafalgar, he showed himself an unrivalled master of tactical resource. Since his day the circumstances attending naval actions have been much changed through the introduction of steam and armour-plating, and it is impossible to say what manœuvres would now be employed in a battle between ironclads.

Tadema, SIR LAWRENCE ALMA-, artist, was born at Dronryp, Holland, on January 8th, 1836. He was educated at the gymnasium at Leeuwarden, and the Antwerp Royal Academy. He has been the recipient of many tributes to his learning and talent. In 1879 he was made a Royal Academician and created a knight in 1899. In 1892 the degree of Doctor of Letters was conferred upon him by Dublin University and during the following year he was made a Doctor of Civil Law at Durham. He is a member of the Royal Society of Painters in Water-colours and a Fellow of the Society of Antiquaries. His work is remarkable for its extraordinary erudition, its minuteness of treatment and beauty of detail. His pictures are almost entirely of classical subjects and deal with the life of ancient Greece and Rome. His best-known pictures include: "Clothilde at the Tomb of her Grandchildren" (1858), "The Education of the

Children of Clovis" (1861), "How the Egyptians amused themselves 3,000 years ago" (1864), "Tarquinius Superbus" (1867), "Pyrrhic Dance"



"A SILENT GREETING," BY SIR LAWRENCE ALMA-TADEMA.

(By permission of Mr. Stephen T. Gwynn, the owner of the Copyright.)

(1869), "The Vintage" (1870), "A Roman Emperor" (1871), "The Woman of Amphis" (1887), "The Roses of Heliogabalus" (1888), "The Conversion of Paula" (1898), and "The Finding of Moses."

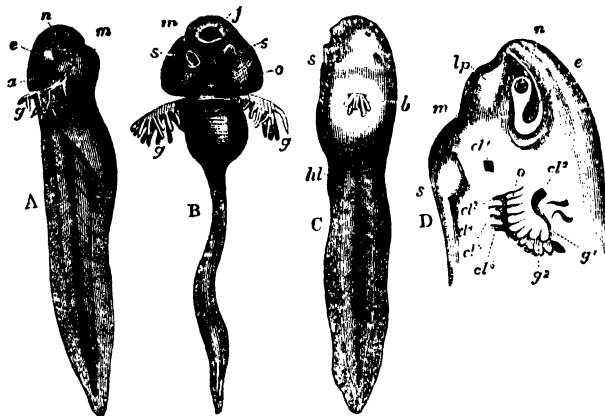
Tadpole, the larva of the frog. The word is also used of other amphibian and of Ascidian larvæ, in which state the creature lives very much after the fashion of a fish. The metamorphosis from the ovum through the tadpole to the perfect animal is very interesting and is thus described by Professor P. Martin Duncan:—"There are minute thread-like gill-fringes, or branchiæ, just behind the head and they only require a heart which will supply them—a single or branchial heart. But as growth proceeds, the branchiæ become hidden in a cavity and then are absorbed, the lungs growing within, and a heart which has a double nature and which relates to the body and also to the lungs, being systemic and pulmonic, is gradually developed. The limbs are at first scarcely perceptible and become gradually developed, passing through a rudimentary stage beneath the skin, from which they do not emerge until they have attained considerable size and a definite shape. The hind legs appear first and they are soon employed to assist in a feeble manner the strong and active tail in moving about. The tail is developed to a great degree, and it is made up of muscles surrounding vertebræ, which form a long column, but they are

not ossified (in those amphibia in which the tail persists the vertebræ are ossified early). As weeks pass on the limbs grow and the tail diminishes by absorption and gets smaller and smaller, until it disappears. It does not drop off, but its substance is received grain by grain into the adult animal. The skull, very cartilaginous at first, becomes consolidated and bony to a considerable extent and thus is more reptilian than fish-like." As growth advances the animal becomes shorter until at last it is not one-quarter of its original length. Tadpoles and young frogs have so many enemies that it has been estimated that not one in a thousand survives.

Tania. [TAPEWORM.]

Tagala, the most important, though not the most numerous, of all the peoples of the Philippine Archipelago, whose original home appears to be the valley of the Pasig ("River of Manila"), whence they spread in remote times to all the central parts of the great island of Luzon, and later to Mindoro and most of the neighbouring insular groups. Their numbers have been estimated at 1,664,000 (which is probably approximately correct) and the Tagalog language is steadily encroaching on all the surrounding idioms. It is a highly-developed member of the Malayo-Polynesian linguistic family, cultivated by the missionaries and written with a peculiar alphabet derived, like so many others in Malaysia, from an Indian (Devanagari) prototype. The Tagalas themselves are certainly of Malay origin, though greatly mixed in some districts both with Chinese and European (Spanish) elements, and consequently presenting a great variety of physical features. But the average type is distinguished by a yellowish-brown complexion, round head, somewhat crushed nose with wide nostrils, rather thick lips, prominent cheekbones, low brow, large black eyes, abundant coarse black hair, and divergent great toe, giving much pliancy to the feet, which are frequently used, like the hands, for prehensile purposes. The national name (*Ta-Gala*) means "Water-People," and the Tagalas still cling to the river-banks, plains, and coast-lands, avoiding the surrounding uplands, and dwelling reluctantly in the large *pueblos* and *barrios*, in which many were forcibly settled by their former Spanish rulers. Such is the fertility of the soil that, despite the national indolence and rude methods of cultivation, they raise heavy crops, especially of rice (the staple food), tobacco, cotton, indigo, maize, cacao, and abaca (Manila hemp). At the arrival of the Spaniards Islam had already made some progress amongst the coast tribes, but the great bulk of the people were still pagans. Since then all have become, nominally at least, Catholics and, instruction being obligatory, considerable numbers possess some degree of education; but many of the old practices survive and the moral

standard is admittedly low. The tendency to relapse into the ancestral savagery is strong, as shown by the numerous class of *remontados*, or outcasts, who



THE TADPOLE.

- (A) Side view, showing gills, *g*; mouth, *m*; nasal sac, *n*; eye, *e*; ear, *a*.
 (B) From below: suckers, *s*; operculum, *o*; horny jaws, *f*.
 (C) More advanced Tadpole, showing growth of operculum, *so* as to enclose gills, save at opening *b* on left side; rudimentary hind limbs, *hl*; sucker, *s*.
 (D) Head of young Tadpole (magnified): External gills, *g*¹ and *g*²; upper lip, *lp*; clefts, *cl*¹ to *cl*⁴.

take refuge in the woods, band together as brigands, plunder the settled districts, and even, before the era of the American conquest in 1898, attacked the suburbs of Manila.

Taglioni, MARIE, dancer, was born at Stockholm, Sweden, on April 23rd, 1809. She was taught dancing by her father, an Italian ballet-master, and made her *début* at Vienna in 1822 with remarkable success. Her style was wholly new. In her view dancing was one of the fine arts and she evolved the beauty and grace of movement, instead of the voluptuous and suggestive methods derived from the East. She was received with enthusiasm at Paris, on her first appearance in 1827, and when she retired in 1845 the zenith of grand ballet was overpast. Two of her famous performances were the Tyrolese dance in *Guillaume Tell* and the fascination *pas* in *Robert le Diable*. She had married Comte Gilbert de Voisins in 1832, but a reverse of fortune later in life compelled her to practise in London as a teacher of deportment, with special reference to presentation at Court. She died in Marseilles on April 24th, 1884.

Tagus, the largest river of the Spanish peninsula. It rises in the mountainous country between the provinces of Guadalajara and Teruel, and flows first north-west, then south-west past Aranjuez, then with a generally west course past Toledo and Alcantara and, entering Portugal, turns south-west at Abrantes and, passing by Santarem, opens out into the Bay of Lisbon, passing due west to the south of Lisbon, entering the Atlantic ten miles below the city at Entrada do Tejo, after a course of 566 miles.

It is navigable for steamers to Santarem, and for small vessels to Abrantes. Most of its tributaries are on the left bank.

Tahiti, formerly OTAHEITE, the chief of the Society Islands, in the South Pacific, 2,000 miles N.E. of New Zealand, and 3,400 miles S.W. of San Francisco. It covers an area of 600 square miles. The formation is volcanic and behind the fertile shores rise well-wooded mountains to a height of 7,300 feet in Mount Orohena. On the coast are coral reefs, inside of which are some good harbours. The temperature is moist and hot, but healthy, and the climate fine. Mother-of-pearl, coco-nut fibre, and trepang are objects of commerce, besides many of the other products, which include the orange, vanilla, bread-fruit, banana, cotton, coffee, cacao, cocoa-nut, yam, sweet potato and sugar. The people, who are Polynesians of fine physique, have reached a fair degree of civilisation and profess Christianity. Tahiti belongs to France. The capital is Papeete (4,282). Pop. (estimated), 11,000.

Tai (T'HA1), i.e., "Free," "Noble," the most general collective name of a widespread Indo-Chinese race, who were formerly dominant throughout the southern half of China, and who still occupy large tracts in Yunnan together with nearly the whole of Further India between Burma in the west and Tongking, Annam, and Camboja in the east. The peoples of Tai speech number altogether over 30,000,000, the chief divisions being the Shans of Yunnan, the Ngio or Shans of the border-lands between Burma, Yunnan, and Siam, the Lao of North and East Siam, the Siamese proper, the Ahoms of Assam, and the Khamti of the upper Irawadi basin. The Shans and the Lao are essentially the same people, and they differ from the Siamese only in their somewhat ruder culture, more vigorous constitution, and more energetic character. All alike are Tai, or Thai, as the Siamese pronounce the word with an aspirate, all are of Mongoloid stock, all are Buddhists, and all speak slightly divergent dialects of the same Indo-Chinese language, which, before the arrival of the Bak tribes (Chinese proper), was the current speech throughout the whole region between the Yang-tso-Kiang and the Gulf of Siam. The fundamental unity of the race is recognised by the various branches, who appear to regard the T'hai-nai, or "Great Thai," of the province of Xiang-Mai as the oldest members of the family. Despite their political ascendancy, the Siamese are only T'hai-noi, or "Little Thai," while the other great branches are named either from their relative position to the T'hai-nai, or from their respective provinces. Thus, those of Yunnan are T'hai-neun, "Upper Tai," and Tai-Lem, Tai-La, etc., are simply the Shans of the provinces of Lem, La, etc. The substantial unity of the Tai race is a great ethnological fact, which has now been thoroughly established, although not yet recognised by European politicians in their dealings with the indigenous populations of Indo-China. [LAO; SIAMESE.]

Tailor Bird (*Orthotomus sutorius*), a bird from the Oriental region, deriving its name from the fact that it stitches two or three leaves together to form a cup-like support for its nest. It bores the holes with its bill and for thread uses cobwebs, silk from cocoons, wool and vegetable fibres. The male is six and a half inches long and the general colour is olive-green.

Taine, HIPPOLYTE ADOLPHE, historian and critic, was born at Vouziers in the Ardennes, France, on April 21st, 1828, and educated at Paris in the Collège Bourbon and the École Normale. He was an enormous reader and soon acquired



H. A. TAINE.

amongst the men of his time a great name for his erudition, judgment and taste. As professor of Philosophy at Nevers, he refused to join his colleagues in approving of the *coup d'état* in 1851 and became for a time suspect. He cut himself adrift from offensive attentions by taking up letters as a calling. His earlier works included an essay on Livy (1853), *Voyage aux Eaux de Pyrénées* (1855), *Les Philosophes Français du XIX. Siècle* (1856), and *Essais de Critique et d'Histoire* (1857). In 1864 he became professor of the History of Art and Esthetics at the École des Beaux Arts in Paris, was made D.C.L. of Oxford in 1871, was elected to the Academy in 1878 and died in Paris on March 5th, 1893. His chief work is *Les Origines de la France Contemporaine* (1875-90), in which he attacks the Revolution. The *Histoire de la Littérature Anglaise* (1863-4) is a remarkable example of the attempt to apply the inductive method to literary studies. He was a brilliant writer and a courageous thinker, patient in research and dominated by a love for truth.

Tai-Pings, the name by which the followers of the Chinese rebel leader Hung Hsiu-chwan (1813-

64) are known to the outside world. Tai-Ping ("Grand Peace") was really the name of the dynasty of which Hung was to be the founder. He was born in the province of Canton, and in early life acquired some perverted notions of Christianity, which worked strangely in his mind. Believing he was summoned by a divine call to overthrow the Manchu dynasty and establish a new religious and political era, he proceeded, in concert with two friends who shared his views, to organise an insurrection, which broke out in 1851 in the province of Kwang-si. It gradually extended northwards, and in March, 1853, the rebels appeared before the gates of Nanking. From this city, which was soon taken, a large body was sent against Peking. It advanced nearly to Tien-tsin, but did not venture to attack the capital. In 1855 the insurgents began to lose ground, owing to the decline of religious enthusiasm and the rivalry of Hung's subordinate "kings." The emperor was aided by a body of foreigners led by an American, General Ward, and after his death in 1862 a British contingent was raised in Shanghai, the command being now taken by Colonel Charles Gordon. The rebels were speedily dispersed, Nanking falling in July, 1864. Hung is said to have taken poison.

Tait, ARCHIBALD CAMPBELL, Archbishop of Canterbury, was born at Edinburgh on December 21st, 1811, and educated at Edinburgh Academy



ARCHBISHOP TAIT.

(Photo: London Stereoscopic Company.)

and Glasgow University whence, as a Snell exhibitioner, he proceeded to Balliol College, Oxford. He opposed the Oxford Movement, and was one of

the four tutors who protested publicly against the construction put upon the Thirty-nine Articles in *Tract XC*. He succeeded Dr. Arnold in the headmastership of Rugby in 1842; was appointed in 1849 Dean of Carlisle, where his heavy bereavement (the loss of five of his children through scarlet fever) excited universal sympathy; became Bishop of London in 1856 in succession to Charles James Blomfield and in 1868 he succeeded Charles Thomas Longley as Archbishop of Canterbury. He died at Addington, Surrey, on December 1st, 1882. He was a safe rather than a great primate, having throughout his career been distinguished by tact, moderation and a regard for that which is expedient.

Tait, PETER GUTHRIE, physicist, was born at Dalkeith, Mid Lothian, Scotland, on April 28th, 1831. He was educated at the Academy and University of Edinburgh, and at Peterhouse, Cambridge, where in 1852 he graduated senior wrangler and first Smith's prizeman. In 1854 he was elected to the chair of Mathematics at Queen's College, Belfast, and in 1860 succeeded James David Forbes in the chair of Natural Philosophy in Edinburgh University, a post he held till within a few months of his death, which took place at Edinburgh on July 4th, 1901. He was one of the greatest mathematicians of his time. His contributions to mathematics and physical science include works on *Quaternions* (1866), *Thermodynamics* (1868), *Heat and Light* (1884), a *Treatise on Natural Philosophy*, written in conjunction with Lord Kelvin (1867), and many learned papers in scientific periodicals. *The Unseen Universe* (1874) and *Paradoxical Philosophy* (1878), by Tait and Balfour Stewart, discuss the relations of science and religion.

Tajik (TAJAK, TAUSIK), a term of doubtful origin, dating from the Sassanian epoch of Persia, and in the Pahlavi writings used at first to indicate the Arabs in general, and then their descendants born in Persia or elsewhere out of Arabia. Later, when the distinction was weakened between Arab and Persian Mohammedans, Tajik became the collective name of the latter as well, and according to present usage it applies specially to all communities of Persian stock and speech wherever found in Central Asia. These are co-extensive with the former limits of the Persian Empire, and are found even in Chinese Turkestan beyond those limits. But since the ascendancy of the Turki peoples the Tajiks have become the subject element almost everywhere, except in Darwaz, Wakhan and Badakhshan. In all these regions the Tajiks are essentially the settled or peasant class in the rural districts, the traders and artisans in the towns, and Persian (or some variety of it) is everywhere their mother-tongue. Hence the terms *Pārsivān*, *Delgan*, *Sart*, etc., *i.e.*, "Peoples of Persian speech," "villagers," "traders," etc., currently applied to them by their Turki, Afghan, or Baluchi neighbours. All are Mohammedans of the Sunni sect, although their kinsfolk of Persia are mostly of the Shiah sect. The original Iranian type has been modified in diverse ways by long contact with the surrounding Turki, Mongol and

other races, and much miscegenation has undoubtedly taken place, and is still going on, the tendency being towards a general fusion of all the heterogeneous elements in a new homogeneous race throughout Central Asia. The Tajiks are the *Ta-Shih* (old sound, *Da-Zhik*) of the Chinese records. They are numerous, almost everywhere greatly outnumbering the nomad Mongolo-Tatar populations.

Talbot, an ancient English family, descended from John de Talbot, whose name occurs in Domesday. JOHN TALBOT (?1388-1453), the 6th baron, was created Earl of Shrewsbury in 1442 for his services against France in the reign of Henry VI. He was slain in the heroic attempt to recover Guienne. GEORGE (?1528-1590), 6th Earl, married "Bess of Hardwick" in 1568, and was entrusted with the custody of Mary Queen of Scots at Tutbury Castle in Staffordshire, Chatsworth and Sheffield Castle from 1569 to 1584. CHARLES (1660-1718), 12th Earl, an active politician in the reigns of William III., Anne and George I., received the title of duke, which lapsed on his death without male descendants. In 1856 the elder male line failed, the earldom passing after litigation to the 3rd Earl Talbot.

Talbot, WILLIAM HENRY FOX, one of the pioneers of photography, was born at Lacock Abbey, Chippenham, Wiltshire, on February 11th, 1800, and educated at Harrow and Trinity College, Cambridge. Greatly interested in mathematics, physics, chemistry, and other sciences, he began from 1833 to experiment whether it were practicable to render permanent the pictures thrown by the glass lens of the camera on paper. Working at the subject independently of Louis Jacques Mandé Daguerre, in 1839 he announced his discovery of what he called Photogenic Drawing, which in the following year was developed into the Calotype and afterwards the Talbotype, and became the foundation of the photographic art. Talbot described his process in *The Pencil of Nature* (1841), the first book illustrated with photographs. His services to photography have obscured the researches of Talbot (who became F.R.S. in 1831) in mathematics and astronomy and he was amongst the earliest to decipher the cuneiform inscriptions from Nineveh. He died at Lacock Abbey on September 17th, 1877.

Talc, an Arabic name applied properly to a hydrated magnesium silicate, usually found in a massive or foliated, non-crystalline form. The folia are flexible, but not elastic, thus differing from those of mica, with which talc is popularly confused. Talc does, however, rarely occur in crystals belonging to the Prismatic system. It is white or greenish, translucent, pearly, sectile and greasy. Its hardness is 1 to 1.5 and its specific gravity 2.5 to 2.8. It is not decomposed by acids and before the blowpipe becomes opaque and exfoliates. Steatite, soapstone and French chalk are merely amorphous unfoliated varieties. Talc is undoubtedly a decomposition-product of various anhydrous magnesium silicates.

Talent, the heaviest money-weight used by the ancient Greeks. Three silver talents appear in the course of Greek history—the Æginetan, the Euboic, and the Attic, weighing 83½ lb., 55½ lb., and 57½ lb. respectively, and equivalent to £303½, £203½, and £210¼ of English money. Each talent contained 60 minæ.

Talienwan, a bay on the eastern side of the peninsula of Liao-tung, in the province of Manchuria, China. In 1898 Russia acquired a 25 years' lease of the roadstead and adjacent territory from the Chinese Government. As a result of the Treaty of Peace, concluded (September 5th, 1905) on the termination of the war with Japan, however, Russia was obliged to cede her leasehold and other rights to Japan. One advantage of the bay is that it is ice-free all the year round.

Talisman, a protective charm, differing from an amulet in that it was supposed to derive its efficacy from its being prepared under the influence of the heavenly bodies. It frequently consisted of the figure or character of one or more of the heavenly bodies, engraved on a stone or metal believed to be influenced by them. The distinction is not always observed, and the terms talisman and amulet are often used as if synonymous.

Tallemant des Réaux, GÉRON, man of letters, was born at La Rochelle, France, in 1619. Of his life little is known except that he studied civil and canon law, but declined to practise; that he married his cousin Elizabeth Rambouillet; that he settled on the estate of Plessis-Rideau (the name of which he changed to Des Réaux) in Touraine, which he purchased in 1650; and that he is believed to have died in Paris about 1692. His *Historiettes* or *Mémoires*, composed about 1659, contain much that is interesting concerning the people who frequented the *salons* of the Marquise de Rambouillet. They are not destitute of spicy or scandalous stories, and throw much light on the state of society and characters of the leading actors in contemporary history; they were first published in 1834.

Talleyrand-Périgord, CHARLES MAURICE DE, PRINCE DE BÉNÉVENT, diplomatist, descended from an ancient and illustrious family, was born at Paris on February 2nd, 1754. An accident in infancy, which lamed him for life, shutting out all hopes of a military career, he was educated for the priesthood at the Collège d'Harcourt, at St. Sulpice and at the Sorbonne. His ready address, wit and dexterity in managing men ensured his rapid advance and, notwithstanding his open immorality, he became agent-general for the clergy in 1780 and Bishop of Autun in 1789. He was elected a deputy of the clergy to the States-General, and played a conspicuous part in the National Assembly, advocating the abolition of tithes, proposing the transference of Church lands to the State and drawing up a report upon public instruction that served as a model for future changes in French education. In 1791 he was excommunicated by the Pope and abandoned the clerical profession.

Sent on a mission to London in 1792, he remained in England as an *émigré* till the beginning of 1794, when he was expelled in accordance with the terms of the Alien Act. After eighteen months' exile in the United States, he was allowed to



CHARLES M. TALLEYRAND-PÉRIGORD.

return to Paris and in 1797 became Minister of Foreign Affairs. He was disgraced in 1799, but regained the office under Napoleon, who owed much to his diplomatic skill. In 1806 he was made Prince of Benevento, but, foreseeing the ruin which would follow from Napoleon's policy of conquest, he began to intrigue with the Bourbons and eventually dictated the terms of the emperor's deposition. He was again Minister of Foreign Affairs for a short time under Louis XVIII., both before and after the Hundred Days, and represented France at the Congress of Vienna, but resigned owing to the Royalist reaction. From 1830 to 1835 he was French minister in London, and was a keen advocate of the *entente cordiale* between the two countries. He died in Paris on May 17th, 1838. His *Mémoires* were published in 1891.

Tallien, JEAN LAMBERT, Revolutionist, was born in Paris on January 23rd, 1767. He was educated by the Marquis de Bercy, of whose household his father was a member, and became a corrector of the press on the *Moniteur*. His *Ami des Citoyens*, a printed sheet fixed twice a week on the walls of Paris, attracted the notice of the Revolutionary leaders and, having played a prominent part in the attack on the Tuileries and the September massacres, he was elected to the Convention (September, 1792). After voting for the death of Louis XVI. and helping to bring about the overthrow of the Girondists, he was sent as proconsul to carry out the Terror in Bordeaux. Here he conceived a passion for the beautiful Comtesse Thérèse de Fontenay, who converted him to milder views and earned for herself the name of "Our Lady of Pity." Elected President of the Convention, after his return to Paris, he instigated the attack on Robespierre and, after the latter's fall, became for a time the most prominent figure on the political stage; but at the close of the Convention he ceased to exercise much influence and was soon afterwards deserted by his wife, the former Comtesse. In 1798 he accompanied Bona-

parte to Egypt in an official capacity. On his return he was taken prisoner by the British (1801), but was soon released. He died in great poverty in Paris on November 16th, 1820.

Tallis, THOMAS, musician, was born about 1510, probably in London, since he is supposed to have been a choir-boy at the Chapel Royal. Soon after the dissolution of Waltham Abbey (1540), of which he was organist, he became a gentleman of the Chapel Royal. In 1576 he obtained, along with William Byrd, the monopoly of music-printing, but apparently the loss "fell out to his hindrance," for in eighteen months he obtained from Elizabeth a lease of Crown lands on the ground that he was old and poor. He died at Greenwich on November 23rd, 1585. He excelled in counterpoint and founded the school represented by Orlando Gibbons. He has been truly styled the "father of English Church music." Of the thirty-four motets in the *Cantiones Sacre* (1575), sixteen were composed by Tallis and eighteen by William Byrd.

Tally, a notched stick cleft into two halves, formerly used as a record of sales and loans, the parties to the transaction each retaining one half. The employment of tallies in the English exchequer began in the Norman period, and was not abolished by law till 1783. A square seasoned rod of hazel or willow was notched on one side, the size of the indentations corresponding with the amount of the coin or sum denoted. On two other sides, opposite to one another, were inscribed the sum paid (in Roman figures), the name of the payer and the date of the transaction. The rod so marked was split down the middle, producing two exactly similar pieces, one of which (the "stock" or "tally") was given to the payer, the other (the "counterstock" or "countertally") remaining in the exchequer. When the debt was discharged, stock and counterstock were tied up together, and it was the burning of a large collection of these which caused the destruction of the old Houses of Parliament in London in 1834.

Talma, FRANÇOIS JOSEPH, tragedian, was born in Paris on January 15th, 1763. He was educated in London, and for a few months followed his father's profession of dentistry, but his taste for the stage would not be denied and he made his *début* at the Théâtre Français in 1787. His ascendancy, acquired during the Revolution, was maintained under Napoleon and Louis XVIII. Among his finest impersonations were Marigny in *Les Templiers*, Sylla, and Charles IX. He was a great reformer of stagecraft, especially in the dressing of the plays in the costume of the time to which they referred, and in the avoidance of "ranting." He died in Paris on October 19th, 1826.

Talmud (Hebrew "doctrine" or "study"), the code of ancient laws and traditions accepted by the modern Jews. It exists in two forms—the Talmud of Jerusalem and that of Babylon—each of which comprises two parts, the Mishna, or text, and the Gemara, or commentary. The work of compiling the Mishna was undertaken by the school of Hillel and finally completed under the superintendence of

Rabbi Jehudah Hannasi about the close of the 2nd Christian century. It is divided into six parts (entitled "Seeds or Fruits," "Feasts," "Women," "Damages," "Sacrifices and Holy Things," "Purification"), embracing 63 treatises and 524 chapters. The Talmud of Jerusalem was produced at Tiberias and is supposed to have reached its present form towards the close of the 4th century. The Babylonian Talmud, completed about A.D. 500, was the work of Rabbi Ashe, of the Academy of Sora, and his disciple, Rabina.

Tamarind (*Tamarindus indica*), a large leguminous tree, native of eastern tropical Africa and Australia, long cultivated in India (its name meaning in Arabic "Indian date") and now grown also in the West Indies. In India it is valued as timber, its pinnate leaves yield yellow and red dyes and its seeds are used as an astringent; but its most useful part is the pulpy interior of its pods, which contains citrate and tartrate of potash and sugar and has a mildly laxative action. The Black Tamarind of the East Indies has long pods containing six to twelve seeds, and is imported into the United Kingdom in a dried pressed state, chiefly for the manufacture of sauces. The Brown or Red variety of the West Indies has short pods with one to four seeds, and is imported in syrup. The finest quality is shipped from Barbadoes, that from St. Kitts being inferior.

Tamarisk (*Tamarix*), a genus of shrubs which gives its name to the order Tamariscineæ, distinguished by their twig-like branches, scale leaves, and spikes of small rose-pink flowers. The plant abounds in sulphate of soda and in Arabia exudes a manna valued as a dainty by the Bedouins. *T. gallica*, a native of the Mediterranean area, occurs commonly along the English coasts, but is not indigenous. The bark is astringent and some species also produce valuable galls.

Tambourine, a small drum formed of a ring of wood, over which is stretched a single head of parchment. In the hoop are inserted at intervals a few loose metallic discs which, when the instrument is shaken, make a light jingling and not unpleasant sound. The instrument is of Eastern origin and popular in Spain, where it is often called the tambour de Basque and used to accompany dances.

Tamurlane, TIMUR-I-LENG ("Lame Timur") or TIMUR-BEG, a Tatar chieftain who established a vast empire in Asia, was born at Kesh, forty or fifty miles south of Samarkand, a province of Turkestan, on April 9th, 1336. He was a warrior from his youth and, as the result of prowess and statesmanship, was proclaimed sovereign of Balkh in 1369. From Samarkand city, which he made the capital of his dominions, he overran Persia, extending his conquests to the Tigris and the Euphrates; subdued the Kipchaks of Western Tatar, penetrating to the south-east of Russia, and added to his empire the north of India from the Indus to the Euphrates (1398). After defeating the army of the Mamelukes at Aleppo and sacking Damascus and Bagdad, he gained a brilliant victory over the Ottoman Sultan, Bajazet, at Angora in Asia Minor

(1402). He died, whilst marching to achieve the conquest of China, at Otrar on the Syr-Daria on February 14th, 1405.

Tamil (TAMUL), next to the Telugu, the most numerous division of the Dravidian race, Southern India. [DRAVIDIANS.] The Tamils are concentrated especially in the Carnatic, in Travancore and in the northern half of Ceylon. Tamil is the most harmonious, the richest and most highly cultivated of all the Dravidian languages, with a literature ranging over a period of nearly 1,000 years and abounding especially in poetic works.

Tammany Ring. The American political organisation called the Tammany Society was founded in 1789, taking its name from Tamanend or Tammany, a Delaware chieftain who lived in the days of William Penn. It became a powerful instrument in the hands of the Democrats of New York; but, owing to the excessive number of delegates on the General Committee, the management of affairs was left to an inner circle or ring, headed by William Marcy Tweed (1823-78), which gained a complete control over the municipal revenues and reached the zenith of its power in 1870. The frauds committed by the ring were fully exposed—mainly through the efforts of Louis John Jennings (1836-93), editor of the *New York Times* and afterwards M.P. for Stockport—in 1871, and Tweed died in prison, but the organisation still retains much of its old influence. In 1902 it received a great blow through the succession of Theodore Roosevelt to the Presidency of the United States on the death of William McKinley. This was followed by a severe defeat of the Tammany candidate for the Mayoralty of New York. In 1903, however, Tammany triumphed again.

Tamworth, a town situated on the confines of Staffordshire and Warwickshire, England, at the confluence of the Tame and Anker, 7 miles S.E. of Lichfield. It was the chief royal seat in Mercia, was destroyed by the Danes and rebuilt by Alfred the Great's daughter Ethelfleda. It was a royal mint from the reign of Edward the Martyr to that of William Rufus. Among its parliamentary representatives were Thomas Guy, the founder of Guy's Hospital in London, and the illustrious Sir Robert Peel. Among the principal buildings are the Castle which, though now mostly Jacobean, dates from the Saxon period and is still enclosed by the massive ancient walls; St. Editha's Church, a foundation of the 8th century, but re-erected in the 14th in the Decorated style; the free grammar school, founded by Edward VI.; the town hall, hospital, and Guy's almshouses. The manufactures include paper, clothing and textile smallwares, besides market-gardening and the mining of coal, fireclay, and blue and red brick clay. Pop. (1901), 7,271.

Tanager, a bird belonging to the Passerine family Tanagridæ, of the sub-order Fringilliformes. They are mostly Neotropical, a single genus being widely spread over North America. There are about 400 species, distributed by Dr. Sclater into six sub-families. These birds are closely allied to

the finches, but in many the bill is notched and in some it carries a tooth. They are of small size, none being larger than a thrush, and of brilliant plumage, sometimes shared by the females. Tanagers are well-known cage-birds and some have good powers of song.

Tanaia, or the "Che-liferous Slater," a genus of Isopoda, of interest as it is the only member of this order, or even of the whole of the Sessile-eyed Crustacea or Leptostraca and Arthrostraca, which has a carapace or shield. This structure is usually characteristic of the Stalk-eyed Crustacea or Thoracostraca.

Tancred, a leader of the first Crusade, was a son of the Marquis Odo or Eudes and Emma, sister of Robert Guiscard, and was born in 1078. He led the assault at the taking of Jerusalem on July 15th, 1099, and headed the charge at Ascalon on August 12th in the same year. As a reward for his prowess, he received the principality of Antioch and afterwards that of Edessa. He died in Syria in 1112. His virtues are highly extolled by the chroniclers, and he is one of the heroes of Tasso's *Jerusalem Delivered*.

Tandy, JAMES NAPPER, Revolutionist, was born in Dublin in 1740. He began life as a tradesman, but gradually growing interested in home politics became secretary to the Dublin branch of the United Irishmen founded in 1792. In 1795 he fled to the United States to avoid prosecution. Crossing to France in 1798, he took part in the abortive invasion of Ireland in that year and after its failure made his escape to Hamburg. He was delivered up to the English and after two trials in 1800 condemned to death, but eventually he was allowed to settle in France and died at Bordeaux on August 24th, 1803. He lives in popular sentiment as the hero of the proscribed version of the ballad of "The Wearing of the Green."

Tanganyika, a lake of East Central Africa, situated between 3° and 9° S., and intersected by 30° E., occupying a kind of gorge, with a varying breadth of from 15 to 80 miles, and a length of 420 miles, thus being the longest lake in the world. It lies 2,700 feet above sea-level, has 930 miles of coast, and has been found in parts to have a depth of 168 fathoms. It was discovered by Speke and Burton in 1858, and was considered to belong to the Nile basin, a conjecture disproved in 1871 by Livingstone and Stanley. In 1874 Cameron discovered a western outlet, Lukuga, which, he thought, communicated with the Congo. Stanley disputed the fact of this being a permanent outlet and considered it to form only an occasional over-

flow, but Captain E. C. Hore, of the London Missionary Society, in 1880 decided that it was permanent. The water is fresh and good, and the climate fair,



TANAGER.

TANAGER (SCARLET).

though the excessive evaporation causes an almost constant mist. The lake is subject to violent storms from the south-west, and is surrounded by mountains which rise to a height of 10,000 feet in places. The region is well-timbered, has magnificent scenery and animal life is abundant. The lake is between the Nile basin and that of the Zambesi, and has German possessions on the east, and the Congo Free State and British possessions on the west. There is a road from Lake Tanganyika to Lake Nyasa. This was constructed at the instigation of Scottish missionaries at the cost of James Stevenson and was named after him the Stevenson Road. Although difficult to keep open, owing to the rapid growth of tropical vegetation, it was the first attempt, rough though it be, to construct a European highway in Central Africa.

Tangent. A curve may be cut by a line in two or more points, and such a line is called a

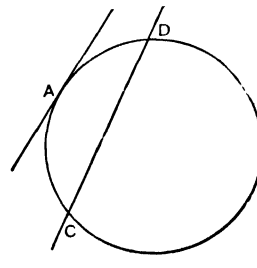


FIG. 2.

chord, but these points may be made to approach each other as the chord varies its position until at last they become coincident. When this occurs, the line is known as a tangent to the curve. In the case of a circle or any other conic section, the tangent touches the curve at two consecutive points.

These two points occur at A, the tangent there being the limiting case of the chord C D (Fig. 1). In the case of

a curve, such as that formed by the letter S, for example, which can be cut by a straight line in three points, the tangent may touch it at three coincident points and cut it at the same time; or it may touch it at two coincident points and cut it at a third (Fig. 2). This passing of the tangent from one side of the curve to the other will occur whenever a chord cuts the curve in an uneven number of points; when, on the contrary, a chord cuts it in an even number of points, the tangent leaves the curve on the same side as it met it.

In trigonometry, the word tangent is used to denote a certain function of an angle. Thus, if BAC be any angle (Fig. 3), and PM be drawn from any point P in AB perpendicular to AC , the ratio of the perpendicular PM to the base AM is known as the tangent of A . This is usually abbreviated into $\frac{PM}{AM} = \tan A$. The old definition of tangent was somewhat different from this. Thus, if BAC were the arc of a circle whose centre was A (Fig. 4), and

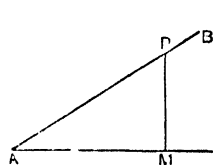


FIG. 3.

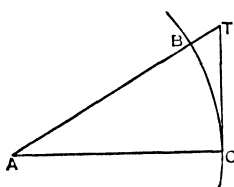


FIG. 4.

if TC were the tangent to the circle at C , meeting the radius AB in T , then TC was said to be the tangent of the arc BC . Since it was a line, and not a ratio, its value depended on the radius of the circle. The radius of the circle had therefore always to be given. The modern definition overcomes this difficulty and the tangent of an angle has a perfectly constant value. In this case—

$$\tan A \text{ is } \frac{TC}{AC} = \frac{\text{tangent of the arc}}{\text{radius of the circle}}$$

which connects the values of the old and new functions.

Tangent Galvanometer. [GALVANOMETER]

Tangier, incorrectly TANGIERS, a seaport of Morocco, North-Western Africa, on the Strait of Gibraltar, 14 miles E. of Cape Spartel. The town has walls and a citadel, and rises in the form of an amphitheatre, presenting a pleasant view from the sea. The principal street leads from the Port Gate to the Market Gate and a brisk trade goes on in the Soko, or market, where camels, donkeys, Moors, Kabyles, Jews, snake-charmers and fortune-tellers are congregated in picturesque confusion. The other streets are narrow and the architecture is poor. The Kasbah, or prison, is the chief sight of

the town. There is a large trade with Gibraltar, the other industries being the manufacture of woollen cloth, mats and pottery, and there is some tanning. The climate is temperate and healthy, but there is at times a scarcity of water. Tangier formed part of the dowry of Catherine of Braganza on her marriage to Charles II., but was abandoned by England in 1694. Colonel Kirke, with his "Lambs," was quartered here and the Royal West Surrey Regiment still carries the Lamb and Flag in commemoration; while a spot at Taunton in Somerset, where the regiment was stationed in the Monmouth campaign, still bears the name of Tangier. Pop. (estimated), 30,000.

Tangutans (*i.e.*, "Dwellers in houses"), a term formerly applied by the Mongolian nomads (dwellers in tents) to the Tibetans in general, but now restricted to the north-eastern branch of that race in the West Kansu uplands, the Koko-Nor, Tsaidam and Upper Hoang-ho basins. This region is supposed to be the original home of the Tibetans, who migrated southwards to Lhasa about 400 B.C. In mediæval times the Tangutans, who always call themselves Bod-pa, like all other Tibetans, rose to great power and established a strong kingdom, which about coincided with the limits of the Chinese province of Kansu taken in its widest sense. They are described by the traveller Nicholas Prejevalsky as of somewhat gipsy-like appearance, above the mean height, with thickset figures, broad shoulders, large dark eyes, straight and even aquiline nose, long face, thick beard and whiskers and tawny complexion.

Tanjore, the capital of a district of the same name in the Presidency of Madras, India, on the right bank of the Cauvery, 180 miles S.S.W. of Madras. The buildings include the great temple, one of the most famous in India, the dismantled fort and the palace of the old Rajahs. The town is famed for its manufactures of artistic goods, including silk carpets, jewellery, repoussé work, copper ware and models in pith and other materials. Attacked by the French under Count Lally in 1758, it was captured by the British under Colonel Joseph Smith in 1773. The territory was ceded in 1779 to Great Britain, to which the capital and environments lapsed in 1855. Pop. (1901), 57,870.

Tank-Worm, the young larva of the Guinea-worm or Filaria, a parasite common in man in tropical countries, where it causes the disease known as hæmaturia (the condition in which blood is found in the urine). Its popular name is derived from the fact that the larva lives in mud in the bottom of tanks and pools.

Tannahill, ROBERT, song-writer, the son of a silk-weaver, was born at Paisley, Renfrewshire, Scotland, on June 3rd, 1774. He became a weaver himself and, after working in Bolton, Lancashire, for a short time, settled in his native town on his father's death in 1802. He had displayed a gift for song from his early years and published a volume of poems in 1807, besides contributing to various periodicals. Falling, however, into a

melancholy and depressed state, he drowned himself in the canal at Paisley on May 17th, 1810. His reputation rests on his Scottish songs, some of which—such as “Jessie, the Flower o’ Dunblane,”

with skins of animals and so rendering them incapable of putrefaction. To this quality their usefulness in leather-making is due. Most of them break up when acted on by dilute acids forming gallic



TANGIER FROM THE SEA.

“The Bonnie Wood o’ Craigielea,” “Gloomy Winter’s noo awa’,” “The Braes o’ Gleniffer,” and “Loudoun’s Bonnie Woods and Braes” — are assured of lasting favour.

Tannhäuser, a Bavarian knight of the 13th century, who resided as minnesinger at the court of Frederick II., Duke of Austria. Through some unknown circumstances in his life he became the central figure in an ancient legend, supposed by Grimm to typify the early struggle between Christianity and Paganism. In the course of his wanderings Tannhäuser arrives at the mount of Lady Venus and there lives in luxury and self-indulgence, but at last repents of his evil courses and repairs to Rome to seek absolution from the Pope. The Holy Father tells him that the budding of his staff would be a smaller miracle than Tannhäuser’s forgiveness, whereupon the knight returns in despair to the fairy court. Three days afterwards the staff buds, but all the Pope’s endeavours to find Tannhäuser are fruitless. This mediæval German legend formed the subject of one of Richard Wagner’s most popular operas.

Tannic Acids. A number of compounds, all intimately related, are known under the name of tannic acids or tannins. They occur widely diffused in the vegetable kingdom, being found in a large variety of plants—*e.g.*, nutgalls, sumach, tea, coffee and many woods. They are soluble in water, the solution possessing acidic properties and a strong astringent taste. With solutions of ferric salts they give an intensely deep blue or green coloration or precipitate. They possess the power of combining

acid and grape-sugar with other products. They thus belong to the class of compounds known as glucosides. Ordinary tannic acid is obtained chiefly from nutgalls by finely powdering and extraction with commercial alcohol and ether. A solution of the tannin in the water present with these sinks to the bottom and is collected. It is a colourless compound, very soluble, which decomposes into pyrogallic acid if heated. Its reactions prove its constitution to be that of digallic acid, $C_{14}H_{10}O_9$. It is used to a large extent in dyeing, calico-printing, in tanning, and for the manufacture of ink. Tannin forms a valuable gargle, owing to its astringent property, in relaxed throat and is also an excellent styptic.

Tansy (*Tanacetum vulgare*), a handsome perennial Composite plant, occurring in the temperate regions of the Old World. It grows about two feet high, with much cut pinnate leaves and corymbs of golden, button-like, rayless capitula. The whole plant is strongly aromatic and bitter, and was formerly made into a wine valued as a stomachic and was also used for flavouring puddings and cakes.

Tantallon Castle. [NORTH BERWICK.]

Tantalum (symbol, Ta), a rare metallic element which was discovered in 1802 in some rare minerals known as tantalite and yttrotantalite. The metal itself has been obtained as a black powder of specific gravity 10·8, which burns if heated in air or in chlorine gas. It is unacted on by acids, with the sole exception of hydrofluoric

acid. It forms a number of oxides, one of which—the pentoxide Ta_2O_5 —acts the part of an acid oxide, uniting with bases to form salts known as tantalates. It forms also a nitride TaN , a metallic-like compound. The atomic weight of tantalum is still uncertain, but it appears to lie between 182 and 183.

Tantalus, a character in Greek mythology who was allowed to be present at a banquet of the gods. As a punishment for betraying the counsels of Zeus, who was said to be his father, he was endowed with an unquenchable thirst in the lower world and condemned to stand up to the neck in water, which receded from his thirsty lips whenever he tried to drink it, whilst above him branches laden with fruit dangled just beyond his reach. Hence arose the verb “to tantalise.”

Tapestry, an ornamental fabric of the textile class, much used during the Middle Ages as a material for curtains and hangings, and to cover the walls and furniture of churches and baronial halls. The weft, which may represent any scene drawn from nature, history or domestic life, or may consist of a decorative design, is worked on the warp by a process essentially the same as that followed in weaving. The material is usually silk or wool of various tones and hues, and in former times the design was frequently wrought in gold or silver thread. It is incorrect to use the term of fabrics in which the weft is produced by means of the needle. The art appears to have been introduced into Europe by the Saracens; hence the term Sarazinois applied to the fabric in mediæval times. From Flanders, where it had taken root in the latter part of the 12th century, it was carried to various parts of Western Europe by the refugees who were driven from their fatherland by the tyranny of the Spaniards. “Arras,” which long survived as a general name for European tapestry, recalls the French town which had been especially noted for its manufacture. Since the early part of the 17th century the highest class of tapestries has been produced at the famous Gobelins works in France. Tapestry-weaving is said to have been introduced into England in the reign of Henry VIII., and a manufactory existed at Mortlake from 1619 to 1703.

Tapeworms are a group of worms the members of which live as parasites in the intestines of different vertebrates. They belong to the class of Cestoidæ, in the article on which is an account of their anatomy and life-history. The typical forms belong to the family Tæniidæ and the genus *Tænia*. The connection between the cystic and tapeworm stages was proved by experiments by Küchenmeister in 1851, who fed cats and dogs with cysts found respectively in mice and rabbits. There are seven families of Tapeworms, of which that of the Tæniidæ is the chief. Some, such as the *Diphylidæ* and *Tetraphyllidæ*, are parasitic only on fish. Of the three adult forms occurring in the human subject, the *Tænia solium* and the *Tænia medio canellata* are the most common; the third form, the *Bothriocephalus latus*, is met with only in certain parts of

Europe, and is very rarely seen in the United Kingdom. The *Tænia solium* may attain to the length of 8 or 10 feet. The larval form of this tapeworm is known as the *Cysticercus cellulosæ*. It inhabits the muscles of the pig, rendering the flesh “measly,” as it is called, and the consumption of such “measly pork,” in an imperfectly cooked state, is the cause of the introduction of the tapeworm into the human intestine. The larval form sometimes occurs in man and in that event it is usually the muscles, brain, or serous membranes which are affected. The *Tænia medio canellata* resembles the *Tænia solium* in many ways. Its head is thicker, however, and it has no hooklets. The larval form of this worm occurs in the ox tribe. The presence of tapeworms in the human intestine may give rise to many symptoms of a variable and indefinite character; the diagnosis of their existence can only be certainly made by detecting their joints in the stools or by the discovery of the ova on microscopic examination. The remedy usually employed to expel the worm is liquid extract of male-fern, a powerful drug, which should only be taken under professional advice.

Tapioca, the partly-torrefied, agglomerated starch of the Cassava or Manihot, forming a light, pleasant farinaceous food. It is prepared, in Brazil, Peru, Guiana, Africa and Penang, from the large tubers of the euphorbiaceous *M. utilisima*, the Bitter, and *M. Aipi*, the Sweet Cassava, and contains 83 per cent. of starch. Its starch is partly converted into dextrine in the process of manufacture, which consists in heating the cassava starch on iron plates. An imitation is prepared from potato-starch. Some British imports come from Brazil, and other qualities from Singapore, the varieties being known in trade as “flake,” “pearl,” and “flour.”

Tapir, any individual of the genus *Tapirus* of the odd-toed division of Ungulates, with four



TAPIRS.

species from America and one from the Oriental region. In form they are somewhat like large pigs, the ears are short, the eyes small and the snout is produced into a short flexible proboscis used for gathering their vegetable food. The fore limbs bear four and the hinder ones three digits. In



habit the tapirs are solitary and nocturnal, frequenting the depths of forests and the banks of lakes and rivers, the latter situation affording them opportunities for bathing and a place of refuge when pursued, for they are hunted for their skin, which makes excellent leather, and for their flesh, which is good eating. The American Tapir (*T. americanus*), from Brazil and Paraguay, is the best-known species; there are two others from Central America and one from the high region of the Andes. Their colour when adult is dark-brown, but their young and those of the Malayan Tapir are marked with light spots and stripes on a dark ground. The Malayan Tapir (*T. indicus*), from the Malay Peninsula, Sumatra, and Borneo, has the body white, with the head and limbs glossy black.

Tapping. The removal of collections of fluid from the cavities of the pleura or peritoneum, or from cysts, hydroceles, abscess cavities, etc., is effected by the operation of tapping. This operation is usually performed with a trocar and cannula [CANNULA], sometimes in conjunction with some form of apparatus known as an aspirator, designed to promote the outflow of fluid by suction into a partial vacuum.

Tar, a product of the destructive distillation of organic substances intimately related to the natural asphalts and bitumens. There are two chief varieties, coal-tar and wood-tar. Wood-tar is a dark-brown or black, semifluid, pungent, acid substance, consisting of a mixture of heavy, non-volatile hydrocarbons. It is mainly obtained from the roots and stools of *Pinus sylvestris* in Northern Europe, where it is known as Stockholm and Archangel tar, and from those of *P. palustris* in the Southern United States. It is extracted by a slow combustion of the wood when covered with turf; or more economically in closed retorts, for which the gas evolved serves as fuel. In the latter methods roots yield 16 to 20 per cent. of tar, and on further distillation tar yields wood vinegar, acetic acid, creosote, and oil of tar, leaving a residue of the black, brittle, glossy solid known as pitch. Tar and pitch are largely used for the protection of shipping and other timber from the weather, and the latter also in Berlin or Brunswick black. Tar contains also some pyrocatechin, which is soluble and gives to tar-water the slight medicinal virtue which was so enthusiastically overestimated by Bishop Berkeley.

Tarahumaras, a Mexican people widespread in the states of Sonora, Sinaloa, Chihuahua and Durango, are a branch of the Opatá-Pima family, remarkable for the tenacity with which they have adhered to the old national usages and language. Some are even yet cave-dwellers, though the great majority are now "Mexican citizens" and nominal Christians; but they still observe some of the old rites, which, despite the protests of their pastors, are accompanied by the sacrifice of a sheep or a calf. The Tarahumaras, i.e., "runners," are passionately fond of such public games as involve trials of skill and endurance. At tribal gatherings foot-races and other sports are often kept up for

days together. In the state of Chihuahua, where they are most numerous, they still number about 40,000.

Taranchi, a Mongolian word meaning "peasants," applied specially to the settled agricultural populations of Chinese Turkestan and Kulja. All speak dialects of the Turki language of East Turkestan, and in the north they are of distinct Mongolo-Tatar type, but in the south (Kashgaria) they have been largely assimilated to the Tajiks, so much so that they have been called Iranians of Turki speech. Although Mohammedans, they retain many of the old usages; the women go unveiled and polygamy is little practised. Since the retrocession of Kulja to China large numbers have crossed the frontiers and are now settled in Russian territory.

Taranto (ancient *Tarentum*), a seaport in the province of Lecce, South Italy, situated on the Gulf of Taranto and an inlet called the Mare Piccolo, 50 miles S.S.E. of Bari on the Adriatic coast. It is joined by a bridge to the mainland, there being a sheltered harbour to the east of the town. At the entrance of the harbour are the islets S. Pietro and S. Paolo, and Cape San Vito is on the south-west. Among the chief buildings are the cathedral of St. Cataldo, the antiquarian museum, episcopal palace and the castle. The principal industries are oyster and mussel fishing, and honey and fruits are largely produced. The ancient city, which extended far beyond the limits of the existing town, was noted for its wool, purple and pottery, and was founded by a colony of Spartans in 708 B.C., soon becoming the chief city of Magna Græcia. Archytas, head of a school of Pythagorean philosophy, dwelt here in 400 B.C. After many quarrels with neighbouring cities Tarentum came into collision with Rome in 281 and was taken in 272. For siding with Hannibal in 207 the city was heavily punished and from that time gradually lost its importance. Subsequently it formed part of the Byzantine Empire—a relic of which consists of an aqueduct from the town to the mainland—passing then successively to the Saracens, Norman adventurers, and the kingdom of Naples, as part of which it passed to the present kingdom of Italy. Pop. (1901), 60,733.

Tarantula, a predaceous spider belonging to the family Lycosidae, the Wolf Spiders. It exceeds one inch in length and is found throughout Southern Europe, deriving its name from Taranto in Italy. This variety is said to inflict a poisonous bite which produces a kind of dancing madness called Tarantism, similar to but not the same as St. Vitus's Dance. The victims were formerly exposed to drastic treatment, such as being buried to the neck in earth, but being peculiarly amenable to music, the type of tune known accordingly as Tarantella was invented for their particular benefit.

Tare (*Vicia sativa*), also known as VETCH, a commonly-grown green fodder-plant, with sessile, solitary papilionaceous flowers and smooth black seeds. It is indigenous to the temperate regions of the Northern hemisphere. The seeds are used as food for horses and poultry. The two allied

British weeds *V. hirsuta*, with a two-seeded pod, and *V. tetrasperma* are known as the hairy and smooth tare respectively.

Targum, the name given to the paraphrastic translations of the Old Testament from Hebrew into Aramaic. They were rendered necessary by the Babylonish exile, during which the Jews had forgotten their native language. The practice of translating and expounding the original text is supposed to date back to the time of Ezra, and is seemingly alluded to in Nehemiah viii. 7-9. For many centuries they were handed down by oral tradition and probably the greater number were never committed to writing. The valuable targum of Onkelos on the Pentateuch, which is supposed to be the most ancient, in all likelihood does not date farther back than the latter half of the 2nd Christian century.

Tarifa, a seaport of Spain, the most southerly point of the European continent, in the district of Andalusia and the province of Cadiz, 21 miles S.W. of Gibraltar. The town, which presents evident traces of Moorish occupation, is connected by a causeway with a small island upon which are a fortification and a lighthouse, 130 feet high, throwing a light to a distance of 30 miles. The chief industries are tunny- and anchovy-fishing, leather-making and the growing of sweet oranges. It became a Moorish possession in 710 and was taken by Spain in 1292. General Gough defended it against a French army in 1812. Pop., 11,600.

Tariff Reform is the name given to a movement which has for its object the reform of the tariff of the United Kingdom; i.e., the toll, or tax, or duty which the nation levies on goods coming into the country from abroad. Tariffs are levied by different nations for different purposes. (1) The tariff may be prohibitive, or intended to keep out the article on which it is levied by making it too costly for those who have to buy it. (2) The tariff may be protective, intended to place the article on which it is levied at a disadvantage in respect of a similar article within the country, which is thereby protected. (3) The tariff may be preferential, intended to give a preference to one source of supply of articles coming into the country over some other source of supply. (4) The tariff may be levied with none of these objects, but simply to supply the Government with the revenue which the payment of the tariff affords. In this case the tariff must not be such as to prohibit or prevent the taxed articles from coming into the country, or no toll will be collected. Tariff Reformers claim that their plan would (1) economically broaden the basis of taxation and relieve the burdens of taxpayers; (2) that socially it would improve the condition of the people by affording increased means of employment through the fostering of home industries, and that increase of trade would bring increase of wages; and (3) that, politically, it would improve relations with foreign countries by enabling the United King-

dom to regain its commercial supremacy and uphold the dignity of its trade. But, chiefly, it was contended that it would promote the great ideal of closer union between all parts of the Empire, by fostering mutual commercial interests between the Mother Country and the Colonies and between the Colonies themselves. Such commercial union was to be attained by means of granting mutual advantages in trading which were not given to the foreigner or outside of the Empire; i.e., Reciprocal Preferential Trading.

How did the Tariff Reformers propose to carry out their plan? Mr. Joseph Chamberlain, who came forward in May, 1903, as the exponent of the new financial gospel, proposed the following scheme as a groundwork: Preference to be given to Colonial food products over foreign by means of a duty of 2s. a quarter (480 lbs.) on foreign corn, 5 per cent. duty on foreign dairy and garden products (bacon and maize exempted). Manufactured articles coming into the United Kingdom were to be taxed 10 per cent., in order to give an advantage to the home manufacturers. No raw materials were to be taxed, so that no limit should be placed on material entering the country on which the workpeople might be engaged in manufacturing. The new duties on food should be met by a corresponding reduction of present duties on food, especially on such articles of diet and use as are not produced within the United Kingdom, such as tea, sugar, cocoa, tobacco, etc. A Tariff Reform League was formed, with headquarters in London and Birmingham, and Mr. Chamberlain opened the campaign at Glasgow in 1903. After it became evident that there was at first wide divergence among Unionists themselves on the merits of Tariff Reform, as well as the opposition of the Liberal party to be overcome, Mr. Chamberlain resigned his position in the Government, in order to prosecute his campaign and prepare the constituencies to fight the question at the next General Election. Many changes in the Cabinet succeeded his resignation, the Duke of Devonshire becoming leader of the Unionist Free Traders and founding the Unionist Free Food Club, as a resort of those of the Unionist party who could not follow the Tariff Reformers. The latter derived great help from the Tariff Commission, a body of experts who were called together by Mr. Chamberlain to examine his fiscal proposals and to collect information as to the industrial conditions prevailing in the United Kingdom. Their report on the iron and steel trades appeared first, and the Tariff Commissioners found that the trade had declined relatively to the same trades in other countries, and that this decline was largely due to dumping by foreign countries and heavy foreign tariffs. In order to arrest this decline, to develop Colonial markets, and to increase the employment for the working classes and maintain the existing foreign export trade, it was recommended that there should be (1) a low general tariff for foreign countries, (2)

a lower preferential tariff for Colonies giving preference to British manufacturers, and (3) a maximum tariff for retaliation purposes, subject to reduction by negotiation to the general tariff. By September, 1906, it was found that 14,000 firms had filled in the inquiry forms sent out by the Commission, and 383 witnesses had given evidence as to points raised by the Commission. The evidence was given by men of all shades of political belief. Reports also on the cotton and other industries and the pottery trade were published. A special Agricultural Commission also sat, and their report was published in November, 1906. Memoranda were issued on the German Commercial Treaties and Tariffs, the tariff systems of Europe and the United States, the new Continental tariffs, etc., all showing the effect on British commerce of these hostile tariffs and treaties. The Tariff Reform question was very prominent during the General Election of 1906, and the Liberal party claimed that their overwhelming victory showed that the country had pronounced against Tariff Reform. This was disputed by the Unionists, on the ground that other questions, notably Chinese labour, were brought forward by Liberal candidates. The situation created by Unionist Free Traders voting for Liberals caused heated controversies, and it was openly said that since Tariff Reformers were in an undoubted majority they would welcome Mr. Chamberlain as their leader in place of Mr. Balfour, who had lost his seat (Manchester), but was re-elected for the City of London in February, 1906. After Mr. Chamberlain had (in a letter to Viscount Ridley) publicly refused to assume the leadership of the party, Mr. Balfour repeated in substance what he had said at Manchester in January, 1905, when he indicated that a "half-sheet of notepaper" would contain his views on Tariff Reform, namely: (1) That he claimed freedom of action for the United Kingdom in framing such tariffs as would be most beneficial to it; (2) That he strongly urged such reform as would promote closer union with the Colonies in commerce; (3) That an unfettered conference should be called to discuss the question; and (4) That he did not desire to "protect" or raise home prices. "My own opinion, which I believe is shared by the great majority of the Unionist party," he wrote on February 14th, 1906, "may be briefly summarised as follows: I hold that fiscal reform is and must remain the first constructive work of the Unionist party; that the objects of such reform are to secure more equal terms of competition for British trade and closer commercial union with the Colonies; that while it is at present unnecessary to prescribe the exact methods by which these objects are to be attained, and inexpedient to permit differences of opinion as to these methods to divide the party, though other means may be possible, the establishment of a moderate general tariff on manufactured goods, not imposed for the purpose of raising prices or giving artificial protection against legiti-

mate competition, and the imposition of a small duty on foreign corn are not in principle objectionable, and should be adopted if shown to be necessary for the attainments of the ends in view or for purposes of revenue." To this letter, commonly called the "Valentine Letter," Mr. Chamberlain replied that he would cordially co-operate "in giving effect to this policy and in defending all Unionist principles." Mr. Balfour's declaration of Tariff Reform as the first constructive work of the Unionist party placed the whole question on a different footing. It was now the policy not of a section, but of a party. The Duke of Devonshire and the Free Trade Unionists immediately recorded their dissent from the leader of the Unionist party, and reasserted their opposition both to a general tariff and to a tax on corn. In July, 1906, attention was again called to the subject in two ways. The sixth congress of Chambers of Commerce of the Empire met in London and carried by 105 chambers, 41 dissenting and 21 remaining neutral, a resolution in favour of granting preferential treatment in home and Colonial markets, on a reciprocal basis, each to the other, on the ground that thereby the bond of union would be strengthened and the British Empire freed from dependence on foreign countries for food and other supplies. The Associated Chambers of Commerce of the United Kingdom on September 12th declared that they warmly desired larger Imperial trade, but could not recommend a departure from the home policy of Free Trade, in the absence of practical proposals; but would welcome an Imperial conference for consideration of the matter. Early in 1907 (March 21st) the London Chamber of Commerce declared, by 1,077 votes to 472, in favour of Tariff Reform and a rearrangement of the fiscal policy. The second event of July, 1906, which drew attention to Tariff Reform was the celebration, on July 7th, of Mr. Chamberlain's seventieth birthday, at Birmingham, and his thirtieth year as Member of Parliament for that city. The excitement, however, precipitated an illness of such severity that Mr. Chamberlain was obliged to go to St. Raphael to recuperate. The effect of his absence was two-fold. Tariff Reformers, on the one hand, were deprived of their leader, and, on the other, the old contention that the whole matter was largely an unauthorised programme of Mr. Chamberlain's, and owed its progress thus far to the weight of his authority, had to be abandoned. The rank and file now showed that the principles maintained by the Tariff Reformers had taken root, and propagandism continued quietly but persistently. After Mr. Asquith's Budget of 1907 was produced, repeated attacks were made by the Tariff Reformers in the House on the financial policy of the Government, on the ground that no development of social reform and no reduction of the burden of taxation could be looked for under the Free Trade system, which refused to use the tariff on foreign goods as a means of increasing revenue. The

Government replied that Tariff Reform, to be of any value, was inseparable from the taxation of the food of the people, which they absolutely refused to sanction, and that any scheme of commercial union through preference to the Colonies might lead to political friction. Matters stood thus when the Colonial Conference of May, 1907, was held in London. The Colonial Premiers pressed for some preferential arrangement between the self-governing Colonies and the Mother Country. "Our idea of preferential trade," said Mr. Deakin, Premier of the Commonwealth of Australia, "is that it should be of mutual benefit to all concerned, and unless it was of benefit to the people of this country we would be the last to ask them to share it." But the Government again declared their inability to make any concessions to the Colonies. Nevertheless the following proposition was adopted:—"That while affirming the resolution of 1902, this Conference is of opinion that as the British Government, through the South African Customs Union, which comprises Basutoland and the Bechuanaland Protectorate, do at present allow a preference against foreign countries to the United Kingdom, Canada, Australia and New Zealand, and all other British possessions granting reciprocity, his Majesty's Government should now take into consideration the possibility of granting a like preference to all portions of the Empire on the present dutiable articles in the British tariff."

Tarn, a department of Southern France, bounded on the N.W. by Tarn-et-Garonne, on the N.E. by Aveyron, on the S.E. by Hérault, on the S. by Aude, and on the S.W. by Haute-Garonne. It contains 2,231 square miles, and the northern part is traversed from east to west by the river Tarn. The surface is generally hilly, and in the south and south-west offshoots of the Cevennes rise to a height of over 4,000 feet. The mountains are well wooded and the vine is extensively cultivated on the hills. There are fertile alluvial valleys and fine forests of beech and oak. The chief products are wheat, oats, rye, maize, potatoes, fruit, wine, cattle, geese, turkeys and cheese. Coal, marble and iron are among the minerals and among the chief industries are the manufacture of wool, silk, steel, glass, pottery and leather, besides dyeing, distilling, brewing and sawmills. Albi (22,571) is the capital. Pop. (1901), 332,093.

Tarn-et-Garonne, a department of South-Western France, bounded on the N. by Lot, on the E. by Aveyron and Tarn, on the S. by Haute-Garonne, on the S.W. by Gers, and on the N.W. by Lot-et-Garonne. It occupies an area of 1,440 square miles. The surface has table-lands varying in height from 1,000 to 1,600 feet and the climate is temperate. The principal rivers are the Garonne and its tributary the Aveyron and its affluent the Tarn. The chief products are wheat, rye, oats, maize, potatoes, vines, honey, fruit and hemp, while the live-stock includes cattle, sheep, pigs, horses and asses. The minerals include copper, iron, lithographic stones, gypsum, lime and potter's clay. The principal industries are the manufacture

of silk, paper, candles, leather and soap. Montauban (30,506) is the capital. Pop. (1901), 195,669.

Tarquinius Priscus, the fifth king of Rome, was born at Tarquini, in Etruria. He reigned from 616 to 578 B.C., and is credited with laying the foundations of the Capitol and beginning the drainage system of the city. His grandson, **TARQUINIUS SUPERBUS** (so named from his haughty insolence), seventh king, ascended the throne after murdering his father-in-law, Servius Tullius. The shameful conduct of his son Sextus Tarquinius, in the outrage of Lucretia, led to the expulsion of the family from Rome about 510 B.C., put an end to the rule of kings and established the Republic.

Tarragon (*Artemisia Dracunculus*), a worm-wood differing from most of its allies in having undivided leaves and in not being bitter, is a native of Siberia, cultivated a little in England and universally in France as an ingredient in salads and pickles and for flavouring vinegar.

Tarragona (the Roman *Tarraco*), a seaport of Spain, capital of the province of Tarragona, in Catalonia, 60 miles W.S.W. of Barcelona, pleasantly situated at the mouth of the small river Francoli. The old town, which is dirty, irregular and surrounded by ramparts, is separated from the modern and well-built quarters by a broad street. The 12th-century cathedral is a fine specimen of Gothic architecture, and is 300 feet long by 100 feet wide, the cloisters being among the most beautiful in Spain. The principal industries are the spinning and weaving of silk and jute, and the making of felt and lace, besides distilling, flour-milling, paper-making and soap-making. Tarraco was the capital of a Roman province and among the Roman remains are an aqueduct, the tower of the Scipios and an amphitheatre, much of the stone of which was used in constructing the mole. The modern town suffered seriously in the Peninsular War. Pop. 25,359.

Tarshish, a town of the ancient world, the site of which is somewhat uncertain. It is supposed to have been the Tartessus of the Romans, a town in Spain, near the mouth of the Guadalquivir, probably the modern Cadiz. It was the Western emporium of the Phœnician trade. Some, however, have thought the Biblical Tarshish to have been situated in Arabia, or on the Persian Gulf, or in India; others have identified it with Tarsus. Possibly there were two places of this name.



TARSIER.

Tarsier (*Tarsius spectrum*), a lemur-like animal from the Eastern archipelago.

In size it is rather less than a squirrel: the ears and eyes are large and staring, the tail is long and thin, and the colour fawn-brown. It takes its name from the re-

markable development of the tarsus, or ankle-bone. It frequents the roots of trees, is rather averse from light, feeds chiefly on lizards and is very cleanly in its habits. Monkey-like in looks, it has points of resemblance with the Insectivora and differs very considerably from the other members of the Lemuroidea.

Tarsipes, an animal belonging to the family Phalangistidae, of the order Marsupials, or Pouched Animals, from West Australia, where it is known as the Noolbenger, or Tait. It is about the size of a mouse, with protrusile tongue and prehensile tail and feeds on insects and wild honey.

Tarsus, an ancient city of Cilicia, Asia Minor, situated amid fertile surroundings upon both banks of the Cydnus, whose cold waters are celebrated as having caused the death of Alexander the Great. The names of the deities worshipped and the nature of coins that have been discovered on the site show the city to have been of Semitic origin, but it gradually became Hellenised and in the time of Xenophon was in a prosperous condition. It was noted for its school of philosophers both Stoic and Platonic, among them being Athenodorus and Zeno, and St. Paul, its most distinguished native, came into contact with some of its members. At a later period the general tendency of the city's philosophy was Epicurean. Tarsus became Roman in 66 B.C. and many privileges were conferred upon it by Antony (who here succumbed to Cleopatra, as she sailed up the Cydnus arrayed as Venus rising from the sea) and Augustus. In early Moslem days the city decayed and fell into ruins, but was rebuilt in A.D. 787 by Haroun Alraschid. It passed into the hands of the Crusaders and eventually fell to the Turks. Pop. (estimated), 20,000.

Tartar Emetic is a salt of tartaric acid, $C_4H_6O_6$, in which one atom of hydrogen is replaced by potassium and another by oxide-radical of antimony (SbO). It thus possesses the formula $C_4H_4O_6K(SbO)$. It is easily soluble in boiling water and considerably less so in cold water. It crystallises in shining rhombic forms of composition $2C_4H_4O_6K(SbO) + OH_2$, but the crystals on exposure lose their water of crystallisation and fall to a white powder. It is prepared by boiling antimony oxide with water and cream of tartar. Its solution has a peculiar taste and the compound is used to an extent medicinally as an emetic and sudorific.

Tartaric Acid. The ordinary variety of tartaric acid is a compound which occurs very widely in the vegetable kingdom, being found in many fruits. It is most abundant, however, in grapes, where it exists as an acid potassium salt, which thus forms a deposit in wine-casks, which is known as argol. From this argol most of the commercial tartaric acid is obtained. The acid is a dibasic acid, possessing the formula $C_4H_6O_6$ or $[CH(OH)CO_2H]_2$. It forms crystals of the Monoclinic system, which dissolve easily in water. Its solution acts on polarised light, being what is known as dextrorotatory. It melts at 180° and is converted into an amorphous form known as meta-

tartaric acid. It forms a series of salts known as tartrates; of these the acid potassium salt is almost insoluble in water and is formed as a white precipitate when the acid is added to a solution of a potassium salt. It is well known under the name of cream of tartar. A double salt of potassium and sodium is known under the name of Rochelle salt or Seignette's salt; while a compound with oxide of antimony is employed medicinally as tartar emetic. Besides this ordinary variety, a form which melts at 167° and is laevorotatory, and also a form which does not act upon polarised light, are known. A mixture of the two active forms usually results from the artificial preparation of the acid and is known as racemic acid. It very closely resembles the ordinary tartaric in all its properties and by certain chemical methods may be separated into its two active constituents. Other such compounds, also consisting of a mixture of two optically active compounds, so as to form an apparently inactive substance, are known by the general term of racemates.

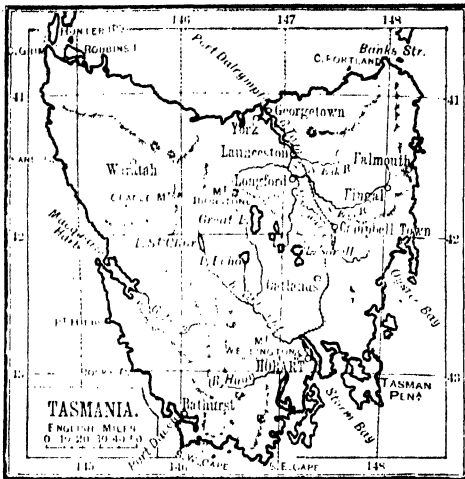
Tartars. [TATAR.]

Tartini, GIUSEPPE, composer, was born at Pirano, Istria, in Austria, on April 12th, 1692. He was educated first for the Church and then for the Law, but turned aside from both for Music. In 1721 he became leader of the orchestra in the church of San Antonio at Padua. He was one of the most accomplished violinists of his time and died in Padua on February 16th, 1770. He composed numerous concertos and sonatas, including the famous "Trillo del Diavolo," or "Devil's Sonata," and wrote treatises on music (1754) and harmony (1767).

Tashkend, capital of the government of Russian Turkestan, Asia, on the Tchirchik, a right-hand affluent of the Syr-Daria, 290 miles N.N.E. of Bokhara. The Russian quarter contains several handsome modern buildings, such as the museum, observatory, public library and the Government offices, while the ancient Asiatic quarter contains mosques, tombs and caravanserais. The industries include saddlery, bootmaking, weaving and dyeing and, since the town was connected by rail with the Caspian and Aral seas, Khojent, Andijan and Orenburg, it has become a very important distributing centre. Pop. (1900), 156,414.

Tasmania, called after its discoverer, Abel Janszen Tasman, a famous Dutch navigator, who sighted the land on November 24th, 1642, and gave it the name of Van Diemen's Land, after the Governor of Java, is an island lying to the south of Victoria in Australia, from which it is separated by Bass Strait. Including the islands in Bass Strait and elsewhere, Tasmania contains 26,385 square miles. The north and north-west are hilly and mountainous, as are parts of the south and east, and in the centre are groups of hills, covered with scrub and forest and having lakes at an altitude of 4,000 feet. The highest points are Ben Lomond (5,020) in the east; Frenchman's Cap (4,760) in the west; Cradle (5,069) also in the west; and Wellington (4,170),

near Hobart. The chief rivers flowing northwards are the Tamar, Inglis, Cam, Forth, Rubicon, Ringarooma and Don, while the Macquarie flows into the South Esk, which unites with the North Esk at Launceston to form the Tamar; to the west run the Arthur, Pieman, King and Gordon; and in the



SKETCH MAP OF TASMANIA.

centre and south are the Derwent—with its tributaries the Cuvier, Nive, Dee, Ouse, Clyde, Jordan, Florentine and Styx—and the Huon. The Great Lake is 50 miles in circumference and other lakes are Sorell, St. Clair, Crescent and Echo. The island is divided into 18 counties and the principal towns are Hobart, the capital (24,655), in the south, on the Derwent, and Launceston (18,077), in the north, on the Tamar. The climate on the whole resembles that of England, but is sunnier, and the eastern districts are very dry and the western regions wet, though the whole is healthy. The lake districts have a climate and aspect very like those of the Scottish Highlands. The dense forest and tangled scrub that occupy much of the surface made Tasmania in times past a favourite haunt of bushrangers. Strong winds prevail on the southern and western coasts. The island is geologically connected with Victoria and among the minerals are tin and coal in abundance, gold, lead, copper, iron, antimony, zinc, silver, manganese, plumbago and asbestos. Tasmania produces enough coal for its own consumption and also an inflammable resin called tasmannite. The animals resemble generally those of Australia, with the exception of the dingo, and the addition of the Tasmanian devil and thylacin. The forests produce tree-ferns, wattle, fragrant evergreens and other trees found in South Australia, the blue gum being largely employed in shipbuilding. Formerly there was much whaling and sealing, but this has fallen off, and there are excellent trout and other fish. The principal crops are wheat, oats, potatoes, hay, hops, apples of

remarkably delicious flavour and a great variety of fruit, extensively exported to the United Kingdom, both in its natural condition and preserved. Sheep, cattle, horses and pigs are raised in large numbers. The chief industries apart from agriculture, fruit-growing and mining, are tanning, sawing, brewing and jam-making. Tasmania was settled from Sydney in 1803 and remained a dependency of New South Wales till 1825, when it was made a separate colony. It was used as a penal settlement till 1853, when transportation was abolished. The island is administered by a Governor and Parliament consisting of a Legislative Council of 18 members elected for six years and a House of Assembly of 35 members elected for three years. Tasmania returns to the Federal Parliament of the Australian Commonwealth six senators and five representatives. The aborigines were nearly exterminated by the white settlers during the "Black War," which raged intermittently between 1805 and 1835. The few survivors were removed to the Flinders Archipelago, where they rapidly died out, and "Lalla Rookh," last of the race, died at Hobart in 1876. The Tasmanians, who at the arrival of the Europeans (1803) numbered not more than 5,000 altogether, showed both Australian and Melanesian affinities and were probably a mixture of the two races with some marked peculiarities due to long seclusion in their isolated environment. The hair was crisp and even woolly, the colour very dark, the frame larger and more powerful than that of the average Australian, while the language, of which some specimens have been preserved, contained several words of New Caledonian (Melanesian) origin, though the structure was rather Australian. The natives were scattered in small tribal or family groups, chiefly round the coast, and stood at an extremely low stage of culture. Pop. (1901), 172,475.

Tasmanian Devil. [DASYURE.]

Tasso, BERNARDO, Italian poet, member of an ancient family settled at Bergamo, was born at Venice in 1493. He studied at Padua and attached himself to the Duke of Ferrara, subsequently entering the service of the Prince of Salerno, under whose protection he settled at Sorrento. Here he composed *L'Amadigi*, an epic in the style of Ariosto, dealing with the adventures of Amadis of Gaul. Having taken part in resisting the Inquisition, he was expelled from Sorrento in 1547. With his wife and family he passed through a period of great suffering, but his last years were spent in the service of the Duke of Mantua, and he died at Ostiglia on September 4th, 1569. He left unfinished an epic called *Floridante* which was completed by his illustrious son, Torquato.

Tasso, TORQUATO, poet, was born at Sorrento, near Naples, on March 11th, 1544. He was educated by his father, Bernardo Tasso, and afterwards studied law at Padua, but devoted most of his time to the composition of his narrative poem *Rinaldo* (1562). In 1565 he entered the service of Cardinal Luigi d'Este, who took him to the castle of his brother, Alfonso II., Duke of Ferrara. After

visiting France with the Cardinal in 1571, he transferred his services to Alfonso, and in 1573 composed *Aminta*, a pastoral play of much lyrical beauty, intended for representation at the ducal court. His religious epic *La Gerusalemme Liberata*, one of the great poems of the world, in which romantic episodes are deftly interwoven with the facts of history, was completed in 1575. His health now began to give way and in 1577, owing to his strange delusions and want of self-control, he was placed in a Franciscan convent at Ferrara. It was formerly believed that his disorder resulted from a hopeless passion for the duke's sister, the Princess Leonora, but of this there is no evidence and the truth probably is that his sensitive and irritable nature was unable to bear the jealousy of courtiers, the strain of composition and the fatuous advice offered by his pedantic critics. He soon escaped from his confinement and after a brief relapse in 1578, during which he consented to submit to medical treatment, he made his way through Mantua, Padua, Venice, Urbino and Lombardy to the Duke of Savoy at Turin. In 1579, on the occasion of the duke's second marriage, he again returned to Ferrara, but his conduct was so violent that he was immured in the hospital of St. Anna, where he remained for seven years. His release in 1586 was due to the intercession of the Duke of Mantua. After a brief sojourn at his court, he passed the remainder of his life in aimless wanderings throughout Italy, dying at Rome on April 25th, 1595, when he was about to receive the laurel crown from Pope Clement VIII. His famous epic was rendered in English under the title of *Jerusalem Delivered* (1600) by Edward Fairfax and in 1763 by John Hoole, who also translated his *Rinaldo* (1792). Fairfax's version is vastly superior.

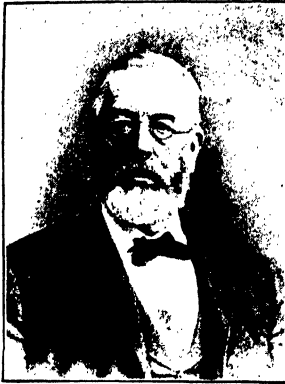
Taste. The end organs of taste are chiefly situated in the tongue. The nerves concerned are the glosso-pharyngeal and certain branches of the fifth nerve. Most of the sensations of taste are to a large extent dependent upon or guided by the sense of smell; there are, however, four primary taste sensations apart from olfactory sensations, which are classed as the sensations of sweets, bitters, acids and salines.

Tatar (TATA and, erroneously, TARTAR), one of the most involved terms in the whole range of ethnology. The original form appears to be Tata, plural Tatar, a Manchu or Tungus word, meaning either "archer" or "nomad," and occurring as early as the 9th Christian century in Chinese records in reference to certain Mongol tribes, which later were driven by the Khitans southwards to the In-Shan Mountains, about the great bend of the Hoang-ho river. Here the predatory Mongols and Tatars, all closely related nomads of Mongolic stock and speech, lived in association and spread the terror of their name amongst all the surrounding peoples, long before the time of Jenghiz Khan, who gave them a world-wide celebrity. Jenghiz himself was of the Mongol tribe on his father's side and of the Tata (Black or original Tata) tribe on his mother's and the result of his conquests was that the term Mongol became dominant in the east and

Tata in the west, which was largely due to the fact that the Tatas generally formed the van of the Mongol expeditions westwards. At an early date (no doubt in consequence of defective hearing) Tatar took the form of Tartar, and thus became associated with the Tartarus, or Hell, of classic mythology, as in the letter of Louis IX. to Queen Blanche (1241). But a far more important change was its gradual transition from the Mongol, or eastern, to the Türki, or western division of the Ural-Altaic race, so that Tatar, originally the name of a Mongolic tribe, is now exclusively used to designate peoples of Türki stock and speech. The change was analogous to that by which the Teutonic Frank became the Romano-Gallic French and was due to analogous causes—Tatar and Frankish dynasties on the one hand, Türki and Romano-Gallic subjects on the other. The powerful Kipchak Empire, founded by Batu-Khan, grandson of Jenghiz, stretching from West Siberia to the Black Sea, was mainly inhabited by Kumans, Pechenegs and other Türki peoples and, when the empire was broken into fragments, each section still continued to be ruled by Tatar (Mongol) Khans and to be called Tatar Khanates. Thus originated the expressions "Siberian Tatars," Kazan, Astrakhan, Krim (Crimean) and other Tatars, meaning Türki peoples ruled by Tatar princes of Jenghiz Khan's dynasty. But the peoples themselves have always disclaimed the title of Tatar, calling themselves and their language Türki, never Tatari. Consequently Türki has again become the collective name of the western division of the "Mongolo-Tatar" family, although Tatar still continues to be applied, especially by Russian ethnologists, to the Türki peoples of Siberia, the Volga (Kazan, Astrakhan), the Crimea, Caucasus, Lithuania and Poland. The Manchu conquerors of China, with whom the name probably originated, are also frequently and correctly spoken of as Tatars. But the word has been properly banished from geographical nomenclature, except, perhaps, in the extreme east, where the expression "Gulf of Tartary" still lingers on some European maps. [TÜRKI; URAL-ALTAIC.]

Tate, SIR HENRY, benefactor, was born at Chorley, Lancashire, on March 11th, 1819. After serving his time in the grocery trade, he entered a sugar-refiner's in Liverpool and ultimately became a producer on his own account, his cube sugar obtaining a universal vogue. He prospered and when he removed to London in 1880 he was recognised as one of her merchant princes. He soon began to turn his great fortune to the public benefit and in 1881-2 gave £42,000 to University College in Liverpool in addition to large donations to hospitals and other charities in London. To the parish of Lambeth he presented four separate public libraries (Kennington, Brixton, Norwood and Camberwell), but his name is permanently associated with the Tate Gallery at Millbank, which he not only built at his own expense (from designs by Sidney R. J. Smith), but to which he also gave 65 pictures from his private collection and which he further undertook to maintain. The building

was officially styled the National Gallery of British Art, but a warmly appreciative public have rightly insisted upon calling it the Tate Gallery. The value of this gift to the nation approximated half a million. Tate was created a baronet on June 27th, 1898, and died at Strentham Hill, London, on December 5th, 1899.



SIR HENRY TATE.

(Photo: Medrington, Liverpool.)

Tate, NAHUM, poet-laureate, was born in Dublin in 1652 and studied at Trinity College. After producing some nine indifferent plays—one of which, however, a version of *King Lear* (which Addison described as an out-
rage on Shakespeare), actually held the stage till 1840,—he took to verse-writing and, in 1692, succeeded Thomas Shadwell as poet-laureate. He is remembered only as the author of the metrical version of the Psalms (1696) which he wrote in collaboration with Nicholas Brady and which was gradually adopted in churches in place of that of Sternhold and Hopkins. It is almost impossible to apportion the authorship, but "While shepherds watched," "As pants the hart" and "Thou, Lord, by strictest search hast known," are among those that have been attributed to Tate. He died in the sanctuary of the Mint, Southwark, on August 12th, 1715.

Tatian, a Christian apologist and heresiarch, was born in Assyria, probably about 110. He became learned in Greek literature and philosophy and adopted the life of a travelling sophist. His conversion, which took place at Rome about 150, was due to the study of the Old Testament and the example of his Christian friends. He attached himself to Justin Martyr and, during his lifetime (possibly in Greece about 153), produced the *Oratio ad Græcos*, an apology for the Christian religion. His Gnostic and ascetic tendencies, which came to a head about 172, occasioned his withdrawal to Mesopotamia, where he opened a school, probably at Edessa. He afterwards became the leader of the Enderites and died at Edessa in or about 180. His *Diatessaron*, composed of materials derived from the four Gospels, throws much light on the history of the canon. It is not a harmony but an edited compilation based on the work of the Evangelists and in certain churches was, for a time, the form in which the Gospel was read.

Tatius, ACHILLES, an Alexandrian Greek of the 3rd or 4th Christian century, author of *Leucippe and Cleitophon*, a romance in eight books. Though

the narrative is tedious, its characterisation feeble and plot improbable, it is written in elegant Greek and, despite its faults and occasional grossness, is interesting as an early example of romance-writing. Treatises on astronomy and etymology have been ascribed to Tatius on insufficient evidence.

Tattersall's, a noted resort in the British horse-racing world, the centre where betting on the turf is regulated and a mart for the sale of racing and other high-class horses. It was founded by Richard Tattersall (born at Hurstwood, Lancashire, in 1724; died in London on February 21st, 1795), trainer to the 2nd Duke of Kingston. The establishment, first opened as an auction mart in 1766, was situated on ground behind St. George's Hospital, Hyde Park Corner, now partly occupied by Grosvenor Crescent. In 1779 Tattersall largely increased his fortune by the purchase of the famous racer "Highflyer" for £2,500 and in 1780 started a stud-farm at Dawley in Middlesex. In the same year the subscription rooms for the use of the Jockey Club were opened. "Old Tatt's" business has been carried on by his direct descendants, and in 1865, when the lease of the original premises expired, was removed to the well-known corner at Knightsbridge Green.

Tattooing, the practice of pricking the skin and filling the punctures with colouring matter, so as to produce an ornamental design. The Tahitian name of these patterns is tatau (from *ta*, "a mark"). The custom prevails throughout a great part of Oceania and is also followed by the Chinese, Japanese, Burmese and aborigines of North and South America. It is not exclusively Oriental (for it probably reached America from Asia), since it was practised by the Britons, who were, in fact, described by the Romans as painted savages, and a large section of the inhabitants of Britain were called *Pietii*, or Painted People. From its prohibition in Lev. xix. 28, it may be gathered that it was known to the races with whom the Israelites were brought in contact. The tattoo sometimes has a religious or



TATTOOED MAORI CHIEF.

social significance; among the Polynesians, for instance, it frequently represents the totem of the clan to which the wearer belongs. Tattooing is very common in Europe, not only amongst sailors, who may have learnt it from savage tribes, but throughout the whole male portion of the lower

strata of the population. Tattooing has not escaped the collector, and General Robley possessed several beautifully-marked heads of Maoris.

Tauchnitz, CHRISTIAN BERNHARD, FREIHERR VON, publisher, was born at Schleinitz, near Naumburg, Germany, on August 25th, 1816. In 1837 he established a printing and publishing business at Leipzig and, four years later, started the *Collection of British Authors* which, under the name of "Tauchnitz Editions," soon became famous throughout the Continent and which already numbers considerably more than 3,000 separate volumes. In 1860 he was ennobled and in 1866 was appointed British Consul-General for Saxony. He died in Leipzig on August 13th, 1895. His son Christian Carl Bernhard, Freiherr von Tauchnitz (born at Leipzig on May 29th, 1841), entered the business in 1866 and carried it on after his father's death.

Tauler, JOHANN, German mystic, was born at Strasburg about 1300 and entered the Dominican Order. In early life he appears to have been a pupil of Meister Eckhart. When the Dominicans were expelled from Strasburg owing to their resistance to a Papal interdict, Tauler withdrew to Basel, where he became associated with the Friends of God. The influence of this fraternity is seen in the practical bent which distinguished him during the remainder of his life. It is especially marked in the *Sermons*, which form one of the earliest monuments of German prose literature. He returned to Strasburg when the period of his exile was over, attended the sick and dying during the visitation of the Black Death. His life was largely spent in the doing of good works and he was an eminent exponent of the virtues of practical piety. He died at Strasburg in 1361.

Taunton, a town of Somerset, England, on the Tone, in the valley called Taunton Deane, 45 miles S.W. of Bristol. A fortress was erected here in 702 by Ina, King of the West Saxons, and the castle built upon its site by a Bishop of Winchester in the 12th century has now passed into the keeping of the Somersetshire Archaeological and Natural History Society. In times past Taunton was one of the West of England "clothing" towns, and has manufactures of shirts, collars, gloves and silk, besides iron- and brass-founding, carriage-building, cabinet-making, malting and brewing. It is an important agricultural centre. The church of St. Mary Magdalene, built in 1500 and restored 1858-62, is renowned for its noble Perpendicular tower, 153 feet high. Other important edifices are the Elizabethan shire hall, the municipal buildings, the King's College, the Independent College, Fox's Grammar School (founded in 1522), the market, the old market house and Taunton and Somerset Hospital. Samuel Daniel (1599-1619), the poet-laureate, and A. W. Kinglake (1811-90), the historian, were natives. In 1497 Perkin Warbeck seized the castle, in 1644 the town was defended for the Parliamentarians by Admiral Blake, Monmouth made a triumphal entry in 1685 and in the same year Judge Jeffreys held here the "Bloody Assize." Pop. (1901), 21,078.

Taunton, capital of Bristol county, Massachusetts, United States, on the Taunton, 35 miles S. of Boston. It owes its name to the fact of having been settled from Taunton, England, in 1637. Among its notable features are Taunton Green, Woodward Springs Park, the city hall, court-house and public library. It has foundries, cotton-mills, locomotive works, copper-works, ship-yards, brick-fields, nail factories, smelting and refining works. Pop. (1900), 31,036.

Tautog (*Tautoga onitis*), a fish belonging to a genus of the family Labridæ of the sub-order Pharyngognathi, a family which also includes the Wrasse. The Tautog, which occurs off the Atlantic shores of North America, is black on the back and sides and whitish beneath and attains a weight of from 12 lbs. to 14 lbs. It is in considerable request as a food fish.

Tavernier, JEAN BAPTISTE, BARON D'AUMALE, traveller, was born in Paris in 1605, the son of a designer of maps who had migrated thither from Antwerp. He made several journeys to the East, visiting Turkey, Persia, Hindostan and the Dutch Indies and amassed great wealth as a trader in jewels. He was ennobled by Louis XIV. in 1669 and in 1670 purchased the barony of Aubonne in Switzerland. In 1684 he visited Berlin for the purpose of establishing a company to trade in the Orient, but this scheme collapsed. He died at Moscow in 1689 on a mission to settle his affairs in the East. His *Six Voyages* (1676) and *Recueil* (1679) were valuable for their commercial information and did much to promote French trade with the Indies.

Tavistock, a town of Devonshire, England, on the left bank of the Tavy, 13 miles N. of Plymouth. It is finely situated on the western borders of Dartmoor and gives the title of marquis to the eldest son of the Duke of Bedford. It was a "stannary" town and was once the centre of an important mining district. Among the chief buildings are the 14th-century church of St. Eustachius, with a tower 106 feet high built upon arches, the Guildhall, Kelly College, the Grammar School, New Hall, the Market Buildings, the Corn Market, the Library and Recreation Rooms. There are statues of Sir Francis Drake (who was a native) and the 7th Duke of Bedford. Pym and Lord William Russell were members for Tavistock. There are a few remains (an Early English arch, a restored Perpendicular gateway and the refectory, used as a Unitarian chapel, with a fine portico) of the Benedictine Abbey of St. Mary and St. Rumon, founded in 961 by Queen Elfrida's father and rebuilt at a later period. This passed at the Dissolution into the hands of the Russell family and still belongs to the Duke of Bedford. The Abbey contained the second printing-press set up in England. The industries comprise copper-mining, brewing and iron-founding, but the town is an important agricultural and distributing centre. Pop. (1901), 4,728.

Tax, an impost exacted by the sovereign or ruling body of a country either for public or private

ends. The principles which should guide the Government of a civilised country in the matter of taxation were formulated by Adam Smith in four famous maxims; (1) "The subjects of every State ought to contribute towards the support of its Government as nearly as possible in proportion to their respective abilities; that is, in proportion to the revenue which they respectively enjoy under the protection of the State." (2) "The time of payment, the manner of payment, the quantity to be paid, ought all to be clear and plain." (3) "Every tax ought to be levied at the time or in the manner in which it is most likely to be convenient for the contributor to pay it." (4) "Every tax ought to be so contrived as both to take out and to keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the State." Taxes are usually distinguished as direct or indirect. According to J. S. Mill, a direct tax is one "demanded from the very persons who it is intended or desired should pay it," whereas in the case of an indirect tax the burden falls, to a disproportionate extent, upon the shoulders of those who can least afford to bear it. The income-tax and dog-tax are examples of the former class, customs and excise duties of the latter. Each system of raising taxes is attended with certain advantages and disadvantages. In favour of direct taxation it may be said that it is more easily adjusted to the resources of the payer, while, on the other hand, the incidence of indirect taxation being less obvious, it is not resented in the same manner by the person who really suffers by it. The right of determining the annual amount of the public revenue and the methods by which it shall be raised in the United Kingdom has from time immemorial belonged to the House of Commons. The drawing up of the Budget is the function of the Chancellor of the Exchequer. Taxes raised for local purposes by municipal and other local authorities are called rates.

Taxation of Costs. There are certain officers of the various Courts of Justice in England appointed for the taxation of costs; thus in the High Court the Masters fill that office, in the County Courts the Registrars. When a master or registrar has taxed the costs and deducted what he has thought proper to disallow from the gross amount, he marks down the remaining sum which is to be allowed and this document is thence called the master's allocatur. There are two ways of taxing costs: (1) As between solicitor and client, which is the more liberal; (2) As between party and party, which is the less liberal scale. At any time before the taxing master's certificate is signed any party dissatisfied therewith may apply to the master to review the taxation and may also appeal to the judge from such review. [SOLICITOR.]

Taxidermy, the art of preparing and preserving the skins of animals (together with the fur, feathers, or scales) and also of stuffing and mounting them so as to produce a close resemblance to the living form. The skinning, which is carried out with sharp knives, scissors, pliers, counterpliers and various other implements, is an opera-

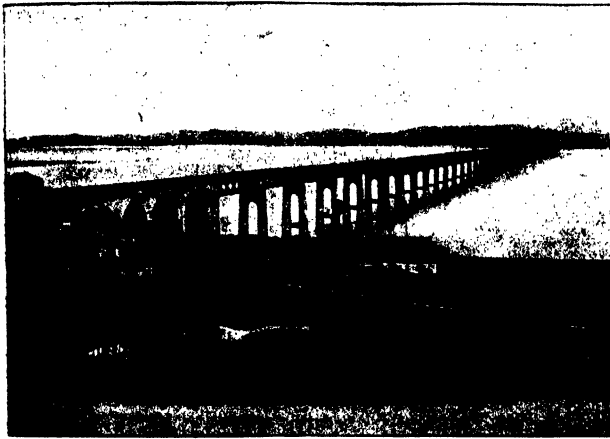
tion requiring great care, as it is important not to stretch the skin and not to ruffle or stain the fur, plumage, or scales. Various mixtures are used for preserving the skin. One of the commonest is the old-fashioned arsenical soap, the usual ingredients of which are white soap, salt of tartar, powdered lime, powdered arsenic and camphor. A good preservative for birds' skins is powdered white arsenic, which may be mixed with powdered alum. For cleaning feathers nothing is superior to powdered plaster of Paris. Of late years much attention has been given to the processes of stuffing and mounting, the best specimens hitherto produced being those at the Natural History Museum, South Kensington, London, under the supervision of Dr. Bowdler Sharpe. Success in taxidermy now requires considerable knowledge of anatomy and skill in modelling as well as an acquaintance with technical details.

Taxocrinidae, a family of Sea-lilies or Crinoida ranging from the Silurian to the Carboniferous period. The best known species is *Taxocrinus tuberculatus*, common in the Wenlock Limestone at Dudley in Worcestershire.

Taxonomy, the scientific classification of animals and plants according to some recognised system, from the Greek *taxis*, "orderly arrangement," and *nomos*, "law." Huxley defined it as "the systematic statement and generalisation of the facts of morphology in such a manner as to arrange living beings in groups according to their degrees of likeness" (*Manual of the Comparative Anatomy of Invertebrate Animals*, p. 16).

Tay, a river of Perthshire, Scotland, rising in Ben Lui (3,708 feet), on the eastern border of Argyllshire and pursuing an easterly and north-easterly direction as far as Logierait, where it takes a south-easterly and finally an easterly and north-easterly course till it reaches the North Sea, after a total run of 118 miles. It is the most beautiful river in Scotland and carries to the sea the greatest volume of water. It is also one of the most valuable salmon rivers. In the early part of its course it is known as the Fillan and then it becomes the Dochart as far as Killin where it enters Loch Tay, which it leaves at Kenmore, whence it is known under its own name. Its chief affluents are, on the left, the Lyon, the Tummel and Isla and, on the right, the Bran, Almond and Earn. The places of interest on its banks are Killin, Taymouth Castle (at Kenmore), Aberfeldy, Dunkeld, Stanley, Perth, Dundee and Broughty Ferry. It is navigable as far as Perth by vessels of about 200 tons burden. During the last 25 miles of its course it forms the FIFTH OF TAY (from half a mile to fully three miles wide), separating the shires of Perth and Forfar on the left from Fife on the right. The TAY RAILWAY BRIDGE crosses the fifth from Newport to Dundee. It is fully two miles long and was constructed between 1882 and 1887 twenty yards to the west of the first Tay Bridge (designed by Sir Thomas Bouch and opened in 1878), which was totally demolished during a violent tempest on December 28th, 1879, a train containing about 50 persons being precipitated with the structure. LOCH TAY extends

for $14\frac{1}{2}$ miles in a north-easterly direction from Killin to Kenmore. It is situated 350 feet above the sea, is from half a mile to one mile and a half wide



TAY BRIDGE.

and has a maximum depth of 600 feet. It is commanded on the north-western shore by Ben Lawers (4,004 feet).

Taylor, ANN, writer of poetry for children, was born in Islington, London, on January 30th, 1782. She was educated at home and, under the tuition of her father (afterwards known as Isaac Taylor of Ongar), acquired some proficiency in the art of wood-engraving. About the age of twenty she began to write for the young and, in collaboration with her sister Jane (1783-1824), published *Original Poems for Infant Minds* (1804, 1805), *Rhymes for the Nursery* (1806) and *Hymns for Infant Minds* (1810). Amongst her contributions to the two former books were the once-popular "My Mother" and the "Notorious Glutton," while of the hymns "I thank the goodness and the grace" was Ann's. After her marriage in 1813 to the Rev. Joseph Gilbert, a Congregationalist minister, her literary activity was almost wholly suspended, but in 1839 she published *The Convalescent*, in 1844 *Seven Blessings for Little Children* and furnished several hymns for Dr. Leitch's collection in 1842. She died at Nottingham on December 20th, 1866. Her *Autobiography and other Memorials* appeared in 1874, under the editorship of her son, Josiah.

Taylor, BAYARD, poet, was born at Kennett Square, Pennsylvania, on January 11th, 1825, and was educated at home and at West Chester and Unionville. In 1842 he was apprenticed to a printer, but finding the calling uncongenial purchased his freedom and set out on a protracted tramp throughout Europe, relating his experiences in letters to the *New York Tribune*, with which he thus began a lifelong connection. On his return to the United States he was engaged in a

variety of journalistic labours, frequently as a travelling correspondent in different parts of the globe. In 1862 he was appointed Secretary of Legation at

St. Petersburg and in 1877 was nominated United States Minister at Berlin, where he died in the following year on December 19th. He was a man of versatile achievement, but his poetic work contained the most enduring qualities. His translation of *Faust* (1870, 1871) is his masterpiece. Other admired volumes of verse were *Rhymes of Travel* (1848), *Poems of the Orient* (1854), *Lars: a Pastoral of Norway* (1873) and *Prince Deukalion* (1878). In fiction he produced *Hannah Thurston* (1863), *The Story of Kennett* (1866), *Joseph and his Friend* (1870) and other stories. His travel books included *Views Afout* (1846), *El Dorado* (1850), *A Journey to Central Africa* (1854), *Travels in Greece and Rome* (1859), *Excursions of Europe* (1869), *Travels in Arabia* (1872) and *Egypt and Iceland* (1874).

Taylor, BROOK, mathematician, was born at Edmonton, Middlesex, on August 18th, 1685, and educated at St. John's College, Cambridge. He was elected a Fellow of the Royal Society in 1712 and acted as its secretary from 1714 to 1718. His *Methodus Incrementorum Directa et Inversa* (1715) contained the first enunciation of the calculus of finite differences as well as the formula called "Taylor's theorem." His two books on *Linear Perspective* (1715, 1719), though too abstruse for most artists, contained, amongst other things, the first general statement of the principle of the vanishing-point. He died in London on December 29th, 1731.

Taylor, SIR HENRY, man of letters, was born at Bishop-Middleham, in Durham, on October 18th, 1800, and was educated at first by his father and later by himself. Early in life he visited Quebec as a midshipman and held a post in the Store-keeper-General's office, which he lost through reorganisation. Before his twenty-fourth year he had shown his literary capacity in the *Quarterly Review*. The bent finally given to his genius was in great measure due to the influence of Southey, whose acquaintance he made in 1823. In 1824 he became a clerk in the Colonial Office, his connection with which lasted till 1872 (he had been knighted in 1869 when the Order of St. Michael and St. George was extended to the Colonial civil service). He died at Bournemouth on March 27th, 1886. His principal works are his dramas, *Isaac Commeneus* (1827), *Philip van Artevelde* (1834), *Edwin the Fair* (1842), *The Virgin Widow* (1850) and *St. Clement's Eve* (1862), which show much dramatic vigour, historical insight, and power of delineating character. His prose works, *The Statesman* (1836), *Notes from Life* (1847) and *Notes from Books* (1849) have been warmly appreciated, though they never

became popular. His utterance, "The world knows nothing of its greatest men," is not without application to himself. His *Autobiography* appeared in 1885.

Taylor, ISAAC, man of letters and mechanician, was born at Lavenham in Suffolk on August 17th, 1787. His father—Isaac Taylor of Ongar (1730–1807),—an Independent minister at Ongar in Essex, taught him drawing and engraving, but about the age of thirty he turned his attention to Patristic literature (he seems to have been the inventor of the word "patristic") and gave up art for letters. His best-known works are *The Natural History of Enthusiasm* (1829), *The Natural History of Fanaticism* (1833) and *Spiritual Despotism* (1835). In 1836 he contested the chair of Logic in Edinburgh University with Sir William Hamilton and almost gained the appointment. Others of his important books were *Ancient Christianity and the Doctrines of the Oxford Tracts* (1839–40), *Loyola and Jesuitism in its Rudiments* (1849), *Wesley and Methodism* (1851) and *The Restoration of Belief* (1855). He was a man of ingenious turn and spent much time amongst his tools. He invented a beer-tap (1824) that came into almost universal use and a machine for engraving patterns on copper cylinders for calico-printing. He died at Stanford Rivers in Essex on June 28th, 1865.

Taylor, ISAAC, philologist, eldest son of the preceding, was born at Stanford Rivers in Essex on May 2nd, 1829. He was educated at King's College, London, and Trinity College, Cambridge. He took holy orders and, after holding various appointments in London and the provinces, became rector of Settrington, near Malton, Yorkshire, in 1875, and Canon of York in 1885. He died at Settrington on October 18th, 1901. He was one of the founders of the Alpine Club and a keen gardener and entomologist. He wrote an interesting book, *The Family Pen: Memorials of the Taylor Family of Ongar* (1867), but his services to the science of languages were of lasting value. Among his philological works were *Words and Places* (1864), *Etruscan Researches* (1874), *The Etruscan Language* (1876), *Greeks and Goths: a Study on the Runes* (1879), *The Alphabet: an Account of the Origin and Development of Letters* (1883), *The Manx Runes* (1886), *Leaves from an Egyptian Note-Book* (1888), *Origin of the Argans* (1890) and *Names and their Histories* (1896).

Taylor, JANE, writer for the young, second daughter of Isaac Taylor of Ongar, was born in London on September 23rd, 1783, and educated at home. She showed great precocity in literary composition and, along with her sister Ann, published *Original Poems for Infant Minds* (1804), in which "The Cow and the Ass" was hers, *Rhymes for the Nursery* (1806), in which the immortal "Twinkle, twinkle, little star," also was hers, and *Hymns for Infant Minds* (1810). After her sister's marriage Jane kept up her literary labours occasionally and in 1815 wrote *Display, a Tale for Young People* and in 1816 *Essays in Rhyme on Morals and Manners*. Her health, always delicate, continued

very precarious and she died at Ongar on April 13th, 1824. Her brother Isaac (1787–1865), to whom she was much attached, published in 1825 the *Memoirs, Correspondence and Literary Remains of Jane Taylor* and in the year of her death her contributions to the *Youth's Magazine* appeared in volume form under the title of *Contributions of Q. Q.*

Taylor, JEREMY, one of the greatest of Anglican divines and preachers, was born at Cambridge, England, and baptized in Trinity Church on August 15th, 1613. His father, a barber, was descended from the martyr Rowland Taylor. He was educated at the Perse Grammar School and Gonville and Caius College, and soon after his ordination attracted the attention of Archbishop Laud, through whom he obtained a fellowship at All Souls', Oxford (1636). He soon afterwards became chaplain to the king and in 1638 was presented to the rectory of Uppingham. On the sequestration of his living in 1642 he joined the king at Oxford. During the succeeding years he appears to have sometimes accompanied the royal army, but in 1646 he set up a school at Newton Hall in Carmarthenshire. He here enjoyed the friendship and protection of Richard Vaughan, Earl of Carberry, in whose mansion, Golden Grove, he wrote several of his works. In 1658 his patron obtained him a lectureship at Lisburn in Ireland. At the Restoration he became Bishop of Down and Connor and in 1661 of Dro-more also. He died at Lisburn on August 13th, 1667. His most important works were *The Liberty of Prophesying* (1646), *The Life of Christ, or the Great Exemplar* (1649), *The Rule and Exercises of Holy Living* (1650) and *Holy Thying* (1651) which have ever held the first place among manuals of devotion, and the *Ductor Dubitantium* (1660), a handbook of Christian casuistry. Jeremy Taylor's chief characteristics as a writer are his rich eloquence, the majesty of his style, and his deep sympathy both with human and external nature. His intellect was subtle, but he exercised it rather on practical questions of conduct than on abstruse points of metaphysical theology. In regard to dogmatics he held that it was impossible to lay down any certain rule, except on essential points of faith, but that considerable scope should be left to the individual mind. Yet, in spite of the breadth of view in these matters which he shows in *The Liberty of Prophesying*, he was a strenuous supporter of Laud on the question of ecclesiastical discipline.

Taylor, JOHN, the "Water Poet," was born at Gloucester, England, on August 21th, 1580, and educated at the grammar school of his native city. He took part in the expedition to Cadiz under Essex (1596), and on his return became a waterman on the Thames, from which circumstance he acquired his popular designation. He was occasionally employed in "stage-managing" the water pageants on public occasions. He indulged in a variety of eccentric freaks for the sake of notoriety, one of the boldest and most laudable being the tramp from London to Braemar in the Scottish Highlands, then a pedestrian excursion entailing

considerable hardship and danger. Of this tour he gave an account in his *Pennyles Pilgrimage* (1618). When the Civil War broke out, Taylor, who was an ardent Royalist, set up a public-house at Oxford. He afterwards transferred his business to London, where he died in December, 1653. Though his verses are little more than doggerel and have small, if any, literary merit, they are of great value to the historian and antiquary. He published in 1630 a collective edition of *All the Works of John Taylor, the Water Poet, being 63 in number*.

Taylor, PHILIP MEADOWS, Indian administrator and novelist, was born at Liverpool on September 25th, 1808. He went as a lad to Bombay, but, opportunity offering, gave up commerce for military and civil duty in the service of the Nizam of Hyderabad, where, from 1840 to 1853, he acted as correspondent for *The Times*. While thus engaged he was entrusted (1841) with the pacification of the state of Shorapore, the Rane of which seemed to be disposed to defy the British Government. By tact, address and courage Taylor not only induced the Rane to resign, but was charged with the administration of the state during her son's minority. Without any troops he was largely instrumental, by virtue of his character and moral suasion, in holding Hyderabad loyal during the Mutiny, and in 1858 was appointed Commissioner of his old district of Shorapore, forfeit by the rebellion of his former pupil the Rajah. His health failing he returned to England in 1860. He now turned his Indian knowledge and experience to account in fiction and produced several remarkable novels—*Tara* (1863), dealing with the establishment of the Mahratta power in 1657; *Ralph Darnell* (1865), treating of the conquests of Clive; *Seta* (1872), a story of the Mutiny, and *A Noble Queen* (1878). *The Confessions of a Thug* had appeared in 1839 and *Tippoo Sultan* in 1840. After wintering in India in 1875, he died at Mentone on May 13th, 1876, on his way back to England.

Taylor, ROWLAND, divine and martyr, was born at Rothbury in Northumberland and educated at Cambridge, where he graduated LL.D. in 1534. The year of his birth is not known. About 1540 he became chaplain to Archbishop Cranmer, who in 1544 presented him to the rectory of Hadleigh in Suffolk. After two trials before Gardiner, he was burnt at the stake near Hadleigh on February 9th, 1555.

Taylor, TOM, dramatist and editor of *Punch*, was born at Sunderland, England, on October 19th, 1817, and was educated at Grange School in his birthplace, Glasgow University and Trinity College, Cambridge. For two years (1845-6) he was professor of English Literature and the English Language in London University, and in 1846 was called to the bar. In 1850 he was appointed Assistant Secretary to the Board of Public Health, becoming Secretary four years later. He retired in 1871 when his office was abolished. Meanwhile he had made a reputation as art critic for *The Times* and *Graphic*, in addition to being one of the most prolific and most successful of playwrights. His

more serious works included a *Life of Benjamin Robert Haydon* (1853), *Charles Robert Leslie's Autobiographical Recollections* (1860) and *Leicester Square: Its Associations and its Worthies* (1874). In 1874 he succeeded Shirley Brooks in the editorial chair of *Punch*. He died at Wandsworth, London, on July 12th, 1880. His best-known plays comprised *Masks and Faces* (1854, along with Charles Reade), *To Oblige Benson* (1854), *Still Waters Run Deep* (1855), *Our American Cousin* (1858), *New Men and Old Acres* (1859, with A. W. Dubourg), *The Overland Route* (1860), *The Ticket-of-Leave Man* (1863), *The Fool's Revenge* (1869), *Trixt Arc and Crown* (1870), *Joan of Arc* (1871) and *Lady Clancarty* (1874).

Taylor, WILLIAM, man of letters, was born at Norwich, England, on November 7th, 1765, and was educated with a view to his conducting the foreign correspondence for his father, a manufacturer of Norwich stuffs. He spent a considerable period in travelling on the Continent and became proficient in several languages, especially in German. On the dissolution of his father's firm in 1791, Taylor took to literature and did great service to his country by his efforts to popularise German authors. He translated Bürger's *Lenore* in 1796, though it was written six years before, Goethe's *Iphigenia in Tauris* (1794), some of Wieland's *Dialogues of the Gods* (1795), and Lessing's *Nathan the Wise* (1805). His most important work, however, was his *Historic Survey of German Poetry* (3 volumes, 1828-30), interspersed with translations. He died in Norwich on March 5th, 1836.

Taylor, ZACHARY, twelfth President of the United States, was born in Orange county, Virginia, on November 21th, 1784. He entered the Army in 1808, and was promoted to the rank of major during the war with Great Britain in 1812-14. As commander in the south-west in 1846, he was ordered to occupy the part of Texas claimed by Mexico and thus brought about the Mexican War. Its chief feature was the crushing defeat inflicted by Taylor at Buena Vista on a force four times as strong as his own (February, 1847). He was now so popular that he was chosen as Whig candidate for the Presidency, and elected, but he only survived his inauguration four months, dying in Washington on July 9th, 1850.

Tchad, Lake. [TSAID.]

Tchamar, low-caste aborigines of India, numerous especially in the North-West Provinces, in Punjab, Bengal, Malwa, Bundelkhand and Gondwana, and numbering altogether over 12,000,000. Although officially free, they still remain practically slaves or serfs, bound to the soil in the rural districts, confined to separate quarters in the towns, everywhere despised and condemned to the lowest pursuits by long-established custom, more powerful in India than legal enactments.

Tea, one of the most important of food-adjuvants, now in daily use probably by half the human race, is an infusion of the leaves of the

Camelliaceous evergreen shrub *Thea assamica* and its Chinese cultivated form *T. sinensis*, of which there are two distinct races, *T. Bohea* and *T. viridis*. *T. assamica* reaches twenty feet in height in the shade of the moist jungles of Assam, where it is indigenous; and has smooth, thick, leathery leaves, sometimes over nine inches long, dotted with translucent oil-glands, and having in their mesophyll, or inner cellular tissue, sphaeraphides and large branching thick-walled cells or idioblasts. *Thea* differs from *Camellia* in having its solitary white flowers directed slightly downwards, each having five persistent sepals with bracts below them, five to nine petals, as many inner or free stamens, and only three carpels, each forming a one-seeded chamber to the ovary, with a distinct style. The cultivated Chinese shrubs are only three to five feet high, much branched, with numerous leaves, not exceeding four inches in length. When young the leaves are densely hairy beneath. *T. viridis*, the more northern variety, has larger, brighter-green leaves, and is harder, than *T. Bohea*. Tea (Chinese *cha*, pronounced *tay* at Amoy) was certainly used in China in the 6th Christian century, having traditionally been introduced from India by a missionary. From China its cultivation spread in the 13th century to Japan; but the substance was unknown in Europe previous to 1517, and the habit of tea-drinking was not brought westwards till the Dutch established themselves at Bantam early in the 17th century. Until 1677 Great Britain was entirely supplied from Java, the price ranging from £10 to 15s. per lb. Thomas Garway, founder of Garraway's Coffee-house, in London, in 1660 offered it for sale at prices ranging from 50s. to 15s. In 1660 a duty of 8d. per gallon was imposed on the sale of the infusion, and in 1689 one of 5s. per lb. and 5 per cent. of the value on leaf-tea. The East India Company bought tea first in Madras and Surat and afterwards at Amoy, and the high duties, coupled with their monopoly, led to much smuggling, adulteration and manufacture of imitation tea. At the close of the 17th century about 20,000 lbs. were imported annually, the price averaging 16s. per lb., and the amount of duty-paid tea consumed in the United Kingdom rose, in spite of heavy taxation, from less than 1½ million lbs. in 1728 to over 10 million in 1784, over 20 million in 1795, and over 30 million in 1833. The consumption of tea in the United Kingdom in 1840 exceeded 1 lb. per head of the population; in 1860 it exceeded 2½ lbs.; in 1880, 4 lbs.; and at the present time it is more than 6 lbs. per head, the same proportion as in China, where the total annual consumption has been estimated at 2,000 million lbs. The total British import was nearly 207 million lbs. in 1880 and over 300 million lbs. in 1905, of the latter 259 million being for home consumption. The United States consumes 0.9 lb. per head; Holland, less than a pound; Russia, less than ½ lb.; but the Australian colonies nearly 10 lbs. per head. More than three-quarters of the British supply is now derived from India and Ceylon, though the cultivation of tea in Assam practically dates from 1840 and in Ceylon from 1876. Tea-planting has also been successfully established in Natal. The tea-

plant requires a deep, friable, moist, but well-drained soil, and a warm, equable, moist climate; and cheap labour is an essential to success in the industry. The leaves are picked so as not to injure their axillary buds, and the younger the leaves on the "flush" or shoot the better the quality. A tree will yield ½ lb. per annum, which will amount to from 300 to 350 lbs. per acre. In making black tea, the picked leaves are withered until limp; rolled, generally by hand; fermented; exposed, if possible, to the sun for an hour; and immediately fired, or dried by hot air or charcoal fumes. Green tea is made in other districts, but from the same varieties, by sweating, softening and rolling fresh unwithered leaves, repeating this rolling, and heating considerably. Chinese green tea is artificially coloured; but that from India is not. Indigo, Prussian blue, French chalk and turmeric are the chief materials used for facing green tea, the most spurious concoctions being known to the Chinese as lie tea. The chief commercial varieties of tea are pekoe, souchong, congou and bohea among black teas, and gunpowder, hyson and caper among green teas, "pekoe" denoting the white hairs of the youngest leaves. Brick tea, a coarse compressed variety, is used almost exclusively in Central Asia, where it is often eaten as a vegetable with milk and fat. Tea contains from .4 to 1 per cent. of a fragrant, narcotic essential oil; from 1 to 3 per cent. of the white, crystalline alkaloid theine ($C_8H_{10}N_4O_2$), identical with caffeine and allied to theobromine, and from 12 to 18 per cent. of tannin, Chinese teas being richer in theine and poorer in tannin than those of India. Unless infused in boiling water, neither the theine nor the tannin is properly extracted. Five minutes' infusion extracts all the theine and essential oil, upon which the tea depends for its stimulating effect upon the brain and the respiratory system. More prolonged stewing only extracts more of the indigestible tannin. Tea has little nutritive value, apart from the sugar and milk often taken with it: in excess it induces nervous irritability and insomnia; but, in the words of Lo Yu, who wrote before A.D. 900, "it tempers the spirits and harmonises the mind, dispels lassitude and relieves fatigue, awakens thought and prevents drowsiness, lightens or refreshes the body, and clears the perceptive faculties."



TEA-PLANT.

Teak, the name, in the Dravidian languages, for the valuable timber-tree, *Tectona grandis*. It belongs to the order Verbenaceae, and is a native of India south of 25½° N. (though cultivated in Assam as far north as 27°), of Burma, Java and the Philippines. It thrives best on low hills, well

drained, with an annual temperature of 75° to 81° F., and a rainfall of over 50 inches; and is associated with bamboos. It reaches 100 to 150 feet in height and 25 feet in girth, and has large opposite deciduous leaves and terminal panicles of small white flowers, succeeded by hairy nuts enclosed in accrescent calyces. The timber is yellow, but darkens in seasoning to brown: its annual rings are well marked by the larger and more numerous vessels in the spring-wood: it contains a considerable quantity of an aromatic oil, to which its great durability is due: when once seasoned, it does not shrink or split: it is not very hard, but is easily worked and takes a fine polish; and weighs from 38 to 46 lbs. per cubic foot, *i.e.*, about 50 cubic feet to the ton. Being heavier than water when green, the trees in Burma are girdled or cut through to the heartwood for a year or two before felling, and they can then be floated down the Salwin or Irrawaddy to Moulmein or Rangoon, down the Menam or Mekhong. The heartwood is not attacked by termites or fungi, and is invaluable as a backing for armour-plated ships, and in India for house-building, railway carriages, parquet floors and furniture.

Teal, a duck belonging to the genus *Querquedula*, of the family Anatidae of the order Anseres. There are seventeen species, universally distributed. They are the smallest of the family. The Common Teal (*Q. crecca*), about 14 inches long, breeds freely in the northern and eastern counties of England and throughout Scotland and Ireland. The Garganey (*Q. circia*), a somewhat larger bird, breeds in East Anglia.

Tealia, one of the best-known and most handsome of British Sea-anemones. The commonest species is *Tealia crassicornis* (Müll.), which is about 2 inches high and 3 inches in diameter and has about 80 conical tentacles. The colour varies greatly; red dotted with orange or green is a common variety.



TEAZLE.

Teazle, or TEASEL (*Dipsacus*), a small genus of prickly biennial plants, natives of Europe and Northern Asia, which give their name to the gamopetalous order Dipsaceae. The opposite cauline leaves in some species are connate, holding rain-water. The flowers are in globular or oblong capitula, opening both centrifugally and centripetally, and each flower is furnished with an involucre of long prickly scales. *D. fullonum*, the Fuller's Teazle, cultivated

in France, Austria, and to some extent in the West of England, is, perhaps, only a variety of the wild British species *D. sylvestris*, from which it differs in its recurved involucre-scales. These scales are

just sufficiently rigid and just sufficiently elastic to raise an even pile on cloth, and the heads are consequently fixed in rows in a frame to form part of the fuller's gig-mill or dressing-machine, no wire-cards yet introduced having proved equally effective.

Technical Education was defined by Professor Huxley as "that sort of education which is specially adapted to the needs of men whose business in life it is to pursue some kind of handicraft." The Departmental Committee appointed in 1904 on the proposed Imperial Technical Centre defined the expression "technological education," which afterwards came into frequent use, as meaning "the branch or branches of technical education which have particular reference to the applications of science to industrial processes, as distinct from those branches which are predominantly manual, commercial, artistic, medical or legal, or otherwise, in this narrow sense, professional." The importance of this subject cannot be exaggerated, and we propose, therefore, to consider (I), how the need for technical education arose; (II), the provision made by legislation to meet this need; (III), the provision made by other countries; and (IV), the position in England.

(I) *The need.* Very little reflection makes it evident that as machinery invades the sphere of handiwork, bitterly though the intrusion is resented, the advantage of mechanical contrivances in accelerating production by the division of labour and otherwise is too plain to be ignored. No process requiring hand-skill is safe from invasion. The interests of industry render it imperative that no consideration must hinder the adoption of rapid methods of manufacture. The opportunity for the training of apprentices in the workshop continually grows less. Formerly the apprentice learned all branches of his craft and became a journeyman. The introduction of machinery tended to the division of labour, and as it proved economical to keep the workman at a particular piece of work, in which he became adept, so there was soon no place for the apprentice. The intimate relations of master and apprentice were threatened with extinction, giving place to those of capitalist and worker. And the necessity for a substitute for the older methods of training led to the gradually developed system of technical classes.

(II) *Legislative provision.* Apprenticeship being largely superseded, the first intervention of the Government followed closely upon the Great Exhibition of the Industry of all Nations, in the Crystal Palace in Hyde Park, opened by Queen Victoria on May 1st, 1851, the first industrial exhibition on a grand scale ever held. Projected by the Prince Consort, it encountered fierce opposition. It was feared that it would stimulate foreign competition with disastrous effect to the national prosperity, and that the pre-eminence of British manufactures would suffer. It did make evident certain industrial deficiencies. At the opening of Parliament in 1852 a scheme was promised to promote the advancement of the Fine Arts and of Practical Science, which became operative in 1853, when

the Science and Art Department was established at South Kensington. Its purpose was: "The creation in the metropolis of a school of the highest class . . . the advantages of which will be experienced by minor institutions throughout the kingdom, not only as furnishing a central source of information, but as a means of furnishing competent and well-qualified teachers for local institutions." This new department took over the control of the Government School of Mines and of the Royal College of Chemistry, founded in 1845, and the institution thus formed having been known by several names, was finally called, in 1890, the "Royal College of Science, with which is incorporated the Royal School of Mines." Throughout its development two main objects were kept in view—the training of teachers of science and the establishment of an advanced school of Technology. In its methods of teaching and the success of its students the Royal College of Science has a distinguished record, but the belief that British industries suffered from the want of suitable instruction for both artisan and manufacturer, induced the Government, in 1868, to nominate a Select Committee of inquiry. Among their conclusions this Committee recognised the existence of a claim upon the national funds for the provision of "Superior Schools for technical instruction requiring costly buildings." Again, in 1870, the conviction that the country was falling behind in the race for industrial supremacy led to the appointment of a Royal Commission, whose investigations dealt with the available sources of scientific instruction in the United Kingdom. The Livery Companies of the City of London by tradition were interested in technical training. The Clothworkers' Company had assisted the Society of Arts in their efforts to promote technical education, and in July, 1877, a special committee of the Guilds applied to Professor Huxley and others to supply them with a report as to the objects and methods of a scheme of technical studies. Their recommendations were adopted, and the success of the City and Guilds of London Institute, founded in 1878, was mainly due to the careful plans which Huxley drew out. "Without his advice," declared one of the members, "we should not have known what to do." The principal work of the Institute was the inauguration and maintenance of the Central Technical College (which was granted a Royal Charter), established at South Kensington, so that the students should be near the Museum and the Royal College of Science, then known as the Normal School of Science. Another Royal Commission was appointed in 1881 to inquire into the instruction of the artisans of certain foreign countries in technical subjects for the purpose of comparison with British industrial classes. Their report, published in 1884, led to the further development of institutions in England, and many attempts were made to give legislative effect to their recommendations. The progress of the movement was largely due to the National Association for

the Promotion of Technical (including Commercial and Agricultural) Education, inaugurated on July 1st, 1887. In March, 1888, a Bill introduced on behalf of the Association was withdrawn on the Government bringing in a measure, on May 17th, but this failed to pass. Not until the passing of the Local Government Act of 1888 was the difficulty as to the local authority for technical instruction settled. By this Bill a number of representative bodies were created, and the work of the National Association was crowned by the Technical Instruction Act of 1889, which marks an epoch in the history of the movement. This Bill conferred on County and County Borough Councils, and also upon Urban Sanitary Authorities, the power to levy a rate not exceeding a penny in the pound for the promotion of technical and manual instruction, but such power was not to be used to supply instruction to scholars in elementary schools. In 1886 the School Board for London, being unable to spend any part of their rate on technical education, applied to the City and Guilds for assistance. A joint committee was formed, and, with funds provided by them and by the Drapers' Company, experiments in manual instruction were made, which, proving successful, the "use of tools" became recognised by the Government Code of 1890 as a subject of instruction. Thus the way was prepared for general technical instruction, but adequate means were still wanting when, by a happy accident, in 1890, during the discussion in Parliament of the question of compensating suppressed public-houses, the residue of the beer and spirit duty was found to be unappropriated. Under the Local Taxation (Customs and Excise) Act, 1890, and the Technical Instruction Act, 1891, the "residue" grant under the former Act was allocated to the Councils for the purpose of technical education within the meaning of the Act of 1889. Committees were formed to whom was delegated, subject to periodical reports to the Council, the responsibility of dealing with the grants placed at their disposal. The amount available under this Act has proved an increasing educational asset. By the minutes of the Science and Art Department new subjects were embraced by the term "technical," and the extended definition now includes both commercial subjects and modern languages. As a consequence of these measures it became evident that further provision should be made for secondary education. In 1899 an Act was passed which established a Board of Education in place of the Education Department, including the Department of Science and Art, charged with "the superintendence of matters relating to education in England and Wales." This was followed by the Education Acts of 1902 and 1903, which repealed the provisions of the Technical Instruction Act, 1889, and removed certain statutory restrictions, such as the abolition of the penny limit to the rate.

(III) *Provision made by other countries.*
FRANCE: Centralisation in the capital was for-

merly the principle of the highest technical training. But after the Law of July 10th, 1896, came into force on January 1st, 1898, provincial universities used the great autonomy they gained to develop technical instruction through their science faculties. Each of the fifteen centres of learning within the Republic takes the name of university, to the council of which all questions of discipline and the settlement of disputes connected with higher education are transferred. The State gives up to these universities the students' fees, and the instruction they receive is in accordance with the industrial needs of the district. Engineers and others are still being trained in special schools, as at the *École Supérieure des Mines* and the *École Centrale des Arts et Manufactures* in Paris, but students having the diploma of chemist or electrical engineer from a university are in great request. **BELGIUM:** Higher technical education is a recognised department in each of the State universities. At Liège, a typical university, the professors of the faculty of applied science rank with those of the other faculties, and students are entitled to receive degrees in science and technology with the students in other faculties. To matriculate they must pass an entrance examination as to the sufficiency of their general education, and then enter upon a two years' course in the science faculty, qualifying for entrance into the technical course. **SWITZERLAND:** By the constitution of 1848 the duty of providing for all forms of education, with one exception, rested with the cantonal or municipal authorities, the Central Federal authority reserving the right to establish a Federal University and a Federal Technical School of an advanced type. The latter was promptly established. Recognising the advantages of its being placed within their borders, at Zürich, the cantonal authorities provided the site and the original buildings and the Federal Polytechnic School was opened in 1855. Its reputation as a centre of education in applied science is world-wide. It does not grant degrees, but the student who has gained the diploma and has prepared a thesis exclusively at Zürich is regarded at the Swiss local universities as eligible practically without further conditions for his doctor's degree. The distinguishing feature of the Polytechnikum is that it gives an advanced scientific course which is predominantly technical. **GERMANY:** Faith in the application of science in the training of the future manufacturer has led to the special development of technical education. The preliminary training is severe. Saving in minor local exceptions, in order to gain admission to the diploma courses of the chief technical high schools, the candidate must supply evidence of having passed through a nine years' course of secondary education. Only on such a foundation is he considered capable of benefiting by the instruction which Germany regards as necessary for the expansion of her trade. His

technical education begins when the training of the average Englishman is ending. Formerly pupils were admitted at the age of fourteen. The minimum age has gradually risen, so that now they seldom enter before nineteen, and as the ordinary course occupies four years, and one year must be given to military service, and one year is required to be devoted to practical work, parents have to support these students to a much later age than is customary in the United Kingdom. The most striking feature in connection with technological education in Germany is the wide scope it embraces, the university standard having been more nearly approximated than in England. Nowhere else has the university system been so carefully elaborated. Popular esteem confers distinction upon the leaders of learning, and the cost of attendance is so small that it has been questioned whether the increase in the number of students ought not to be checked, an increase that is still more remarkable in the technical high schools. The Emperor William II., as King of Prussia, granted the Prussian Technical Schools the power of conferring degrees and honorary degrees, and other German States followed his example. The Royal Technical High School at Charlottenburg was established in 1879 by the union of the Berlin Architectural and Industrial Academies, founded in 1799 and 1821 respectively, whereby much overlapping was obviated, and it was soon found necessary to erect large new buildings, which were opened in 1884. The annual expenses exceed £80,000, two-thirds of which is provided by the State. The six departments have each their own head, with laboratories, libraries and apparatus, and the work is thus grouped: (1), architecture; (2), civil engineering; (3), mechanical engineering, including electro-technics; (4), naval architecture and marine engineering; (5), chemistry and metallurgy; (6), general science, comprising subjects the common property of the first five. THE UNITED STATES being a confederation of self-governing States, the Federal Government, which liberally endows education, has no control over the system, which is local. Hence arises the variety of aim, method and organisation as compared with the German system. The Morrill Act of 1862 gave a powerful impetus to the creation of a number of universities throughout the States, and the institutions which provide higher technical training may be grouped in three classes: (a), Schools and colleges entirely set apart for the study of technology and science which are not under State or Government control; (b), Schools affiliated with other schools or colleges forming universities which also are not under State or Government control; (c), Schools and colleges attached to State universities dependent, generally, on the State and the Government appropriation. Adapting European models in nearly all these institutions the course of studies and the conferring of degrees correspond. The first two years' course is pre-

paratory to the special work of the last two years, at the end of which the degrees earned are conferred and the student is advised to take a post-graduate course of another year's work. The laboratories and workshops are equipped with apparatus and machinery on a scale unknown in England, while the fees are lower. The Massachusetts Institute of Technology, in Boston, may be regarded as a type of the institutions classed under the first group. Founded in 1859 to provide a complete industrial education, this Institute offers thirteen distinct courses, each of four years' duration; eight of these provide scientific and practical training for various engineering professions; four others, chemistry, physics, biology and geology, with a large proportion of pure science, and prepare students for professional practice, for teaching or for scientific investigation. CANADA, whose natural features afford unlimited scope for scientific development and engineering skill, has made ample provision for the study of technology. The principal schools of practical science are affiliated to and form part of a university as at Toronto, the oldest university in the Dominion, where educational courses in civil, sanitary, mining, mechanical and electrical engineering, architecture and analytical and applied chemistry are provided. The principal Canadian university is the McGill University, Montreal. In the faculty of applied science the courses extend over four sessions of seven and a half months each. The study of transportation has been added to seven other courses, being offered to students intending to engage in railway service as a profession. Those taking this course are required to specialise either as civil or mechanical engineers.

(IV) *Technical education in England.* In striking contrast to the enthusiastic support accorded to technical instruction by industrial leaders abroad, particularly in Germany and in the United States, is the fact that employers in England display little preference for the trained workers who come from the technical institutes over the untrained workers. Prejudice is justified by the fact that the training is often imperfect. Boys leaving the primary schools at fourteen, conscious of having acquired all that learning which is rounded off by the "ex-seventh," have lost both the desire to learn and the power of concentration by the time they enter a technical school, usually at sixteen. With an incomplete general education, they are unable to benefit by the instruction they seek. Further, according to a distinguished educationist, Principal Hogg, of West Ham, better teachers are wanted for both day and evening classes in trade subjects, such as brickwork, plumbing, foundry-work, etc., which might be considered as incidentals in a course of study for all students of engineering or building. "The trend of every modern manufacturing process," he says, "towards the intense specialisation of the workman as a machine-hand made the continuance of [Even-

ing] schools a necessity if they were to afford . . . opportunity of self-improvement and so prevent periodic additions to the unemployable of those whose hand-knowledge might by some change of process become obsolete." Notwithstanding, much has already been accomplished.

The University of Leeds has a special department for higher education in the processes involved in the textile and dyeing trades; Liverpool University provides for the study of marine engineering and marine biology. Manchester, Birmingham, Southampton and Sheffield have each their special schools. With the Imperial College of Science and Technology, for which the Royal Commission of the Exhibition of 1851 granted a site at South Kensington, technical training will doubtless attain a stronger position. In April, 1904, a Departmental Committee was appointed to inquire into the working of the Royal College of Science (including the Royal School of Mines). Their final report, dated January 8th, 1906, stated that the determining factor for holding their inquiry was the completion of the laboratories and buildings of the Royal College of Science, at a cost of over £250,000. Further, there was the munificent offer conveyed by Lord Rosebery to the London County Council for the provision, in immediate proximity to these new laboratories, of a school for the most advanced instruction in applied science. And the growth of the gold-mining industry in South Africa forced attention upon the urgency of raising the Royal School of Mines to such a position as to enable it to equip the British mining engineer as the equal of his foreign competitor. The Government consented to bring the Royal College of Science and the Royal School of Mines, including the new laboratories, into the scheme, and the only question pending is as to the incorporation of the Imperial College with the University of London. "In the first instance," its Charter orders, it shall be established "as a school of the University."

There is every desire on the part of educational authorities to support the forward movement. There are many valuable scholarships and exhibitions in force, and admirable work is done by the Polytechnics and Technical Institutes already established throughout the land. Much also has been effected for agricultural education by the County Councils of England and Wales, on which, in 1905-6, the sum of £84,000 was spent, and farmers begin to realise the value of agricultural schools and colleges. The work of the City and Guilds' Central Technical College at South Kensington, opened in 1884 at a cost of £140,000, has already been mentioned. Advanced instruction is provided bearing upon different industries. It is now an integral part of the Imperial College, and is known as the City and Guilds College. It qualifies its students to become mechanical, civil, electrical and chemical engineers, technical teachers, principals, superintendents, and managers of

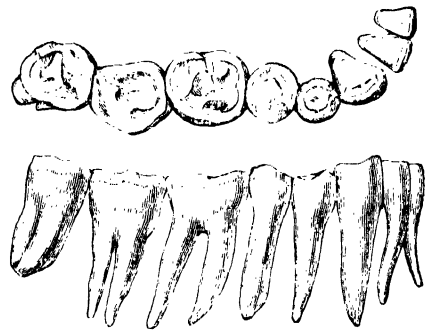
chemical and other manufacturing works. The college at Finsbury is an intermediate college, which includes day and evening classes, for those entering industrial life at an early age, serving also as a preparatory school for South Kensington. The decay of apprenticeship is to be deeply deplored, for with it went the type of workman that ennobled industry and ensured honesty of output. The old relations, to which much pleasant sentiment was attached, by the stress and strain of modern competition are threatened with extinction. The large employer prefers to divide his processes into men's work and boys' work, keeping each to his allotted routine. A report obtained by the London County Council in 1898 stated that "Forty-one typical firms in various branches of building trades having 12,000 employes, had only 80 apprentices and 143 learners, instead of 1,600, which would have been the normal proportion. The trade is recruited from the country." In 1905 their report on the apprenticeship question emphasised the "lack of facilities for training the London boy, and the consequent dependence of London on the country for superior artisans, who, with all-round training, secure the best positions." As the result of recommendations made by their committee, the London County Council opened trade schools for boys and girls of the ages of 14 to 16, and offer scholarships tenable for two years which give, in addition, maintenance grants. At the Stanley Technical Trade Schools, South Norwood, opened in March, 1907, boys of between 12 and 13 years are trained for three years. As the first institution of its kind in England, built and supported by the generosity of Mr. W. F. Stanley, this experiment will be followed with considerable interest. Similar in its aim to the *Écoles Pratiques d'Industrie* of France as a preparation for technical trades, the learner's time is divided equally between ordinary schooling and practical mechanics. In Admiralty dockyards and various departments of shipbuilding and engineering, apprenticeship *plus* compulsory attendance at technical classes is often the recognised means of training the hands. Those who profit most by such instruction are those who learn the practice of a trade in the workshop. But such preparation stops far short of the training given to the foreign student, and the Imperial College must make good the deficiencies in the technical education of Great Britain.

Teck, FRANCIS PAUL LOUIS ALEXANDER, PRINCE AND DUKE OF, only son of Duke Alexander of Württemberg, was born on August 27th, 1837, and educated at the Imperial Austrian Academy of Engineers. He accompanied Field-marshal Count Wimpffen as orderly officer throughout the Franco-Italian campaign of 1857-9, receiving the gold medal for distinguished services at Solferino (June 24th, 1859). He retired from the Austrian service in 1866 and on June 12th of that year married at Kew the Princess Mary of Cambridge. In 1882 he was attached to Sir Garnet

Wolseley's staff in Egypt and was present at the battle of Tel-el-Kebir (September 13th) and other engagements. He was gazetted Colonel in 1882 and promoted Major-General in 1892. In 1897 the Duchess's sudden death affected his health and he died at the White Lodge, Richmond Park, Surrey, on January 21st, 1900. Their eldest daughter Princess Victoria Mary (May) was married to the Duke of York, Prince of Wales, on July 6th, 1893.

Te Deum Laudamus, or **TE DEUM**, an ancient Latin hymn which has always been sung at least once a week throughout the Western Church. The tradition that it was composed by St. Ambrose and St. Augustine on the occasion of the latter's baptism appears to have no authentic foundation. From the manner in which it is mentioned in the "rules of Caesarius of Arles," who was consecrated bishop in 502, it is thought it must have been written before the middle of the 5th century; but as it contains quotations from the Vulgate, it cannot—at least in its present form—be older than the days of Jerome (d. 420).

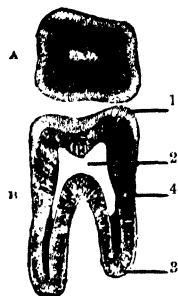
Teeth. A tooth consists of the crown (that is, the portion which projects above the gums), the neck (the somewhat constricted portion of the tooth below the crown enveloped by the gums), and the fang or fangs. On making a section of a tooth, the crown is found to be covered by an outer coating of a very hard substance called enamel; the fang is found to be similarly covered externally by a bony substance, known as the *crusta petrosa* or cement; the body of the tooth beneath these external coverings is made up of a substance known as dentine, and this encloses a centrally-situated cavity—the pulp-cavity—



TEETH.

which contains the highly-sensitive pulp of the tooth, supplied with blood-vessels and nerves, which obtain access to it through an aperture at the extremity of the fang. In the human subject the temporary or milk teeth are 20 in number, each lateral division of each of the jaws containing two incisors, one canine and two molar teeth. The order of appearance of these milk teeth is as follows:—The more centrally-situated incisor appears at about

the seventh month, the lateral incisor a month or two later, the anterior molar at the twelfth month, the canine at the end of about eighteen months, and the posterior molar about the end of the second year. As a rule, the teeth of the lower jaw shortly precede in their appearance the



A, transverse section; B, vertical section of a human molar tooth, showing (1) enamel, (2) pulp cavity, (3) pulp chamber, (4) dentine.

corresponding teeth in the upper jaw. The permanent teeth are 32 in number, each lateral half of each jaw containing two incisors, a canine, two bicuspids or premolars, which replace the temporary molars, and three true molars. The first of the permanent teeth to appear is the anterior true molar, which is cut about the sixth year; the central incisor, the lateral incisor, and the two premolars then appear at intervals of about a year each; the canine is cut about the twelfth year, the second true molar a little later, and the third permanent molar or wisdom tooth appears from about the eighteenth to the twenty-fourth year. The permanent teeth are developed in the jaw behind the temporary teeth, which they ultimately displace; and at the age of five years the germs of all the permanent teeth, except the four wisdom teeth, exist ready formed in the jaw of the child, which thus possesses, up to the time when the first milk tooth is shed, no fewer than 48 teeth—namely, 20 milk teeth and the germs of 28 permanent teeth.

Diseases of the Teeth. Dental caries consists in a gradual eating away of the substance of the teeth, which is probably in great part due to the growth of micro-organisms and ultimately leads to encroachment on the pulp-cavity. When this occurs the tooth becomes tender and sensitive to changes of temperature and, after a time, exposure of the pulp with severe toothache supervenes. Inflammatory changes in the pulp itself are then apt to occur, leading to the formation of alveolar abscess. Sometimes the periosteum covering the fangs of the teeth becomes inflamed and alveolar abscess is set up without previous exposure of the pulp. A common name applied to alveolar abscess is gum-boil. In the treatment of the diseases of the teeth it is most important to obtain the advice of the dentist from the outset, in order that the mischief may be dealt with before the structure of the tooth is so disorganised as to necessitate its extraction. Temporary relief of the pain, produced by inflammation about the root of a tooth, is often obtained by painting the gum with tincture of iodine; and when a cavity exists and the pulp of the tooth is exposed, a small pledget of cotton-wool, upon which one or two drops of creosote have been placed, may be inserted into the cavity, with a view to relieving the toothache until advice can be procured. In view of the suffering entailed by neglect of the

teeth, the desirability of the regular and systematic use of the tooth-brush, especially by children, cannot be too strongly insisted upon.

Teetotalism. [TEMPERANCE]

Tegner, ESAIAS, poet, was the son of a pastor at Kyrkerud, in Wermland, Sweden, where he was born on November 13th, 1782. He was educated at the University of Lund, of which he became professor of Greek in 1812. In 1824 he was appointed Bishop of Wexiö. His principal poems are *Frithjof's Saga* (1820-5); *Azrl*, a romance (1821); and the idyll of *Nattvårdsbarnen* (Longfellow's *Children of the Lord's Supper*) (1820). The patriotic war-song which he composed for the army in 1808 made his name a household word, and in 1817 he wrote his famous "Song to the Sun." In 1819 he was elected a member of the Swedish Academy. He died at Wexiö on November 2nd, 1846.

Teheran, or, more correctly, **TEHRAN**, the capital of Persia, lies to the south of the Elburz Mountains, which rise in the neighbourhood to a height of 18,000 feet, and 70 miles S. of the Caspian Sea. The old fortifications, four miles in circumference, have given place to boulevards and the new fortifications, entered by twelve gates, are ten miles round. The northern side has some fine streets and buildings. The Shah has a magnificent palace in the citadel and there are many country houses on the mountain slopes. The city has bazaars, gas, tramways, telegraphs, and a light railway (6 miles long) to Shah-Abdul-Azim to the south, besides a polytechnic school with a European staff, a military college, and the Imperial Bank of Persia (formed in 1889 by concession from the Shah to Baron Julius de Reuter). Its industries are of small consequence, but it is an important distributing centre. Pop., 280,000.

Tehuantepec, a river-port of the state of Oaxaca, Mexico, on a river of the same name, 19 miles N. by W. of Salina Cruz. It carries on considerable trade in indigo, cochineal, cotton, silk and leather. Pop. (1900), 10,386.

Tehuantepec, ISTHMUS OF, the narrowest part of the republic of Mexico between the Gulf of Mexico and the Pacific. The interoceanic railway constructed at the cost of the State has rendered the isthmus of extreme importance. It was as long ago as 1842 that the project of a railway was first mooted and several attempts were made to carry it out, but it was not until 1898 that it was taken in hand with a final determination to see it through. In that year the well-known English contractors, Messrs. S. Pearson and Son, began operations and by 1904 the bulk of the line was completed. The construction of the terminal ports at Coatzacoalcas, on the Gulf, and Salina Cruz, on the Pacific, was then proceeded with, and on January 23rd, 1907, the whole system was opened at Salina Cruz, the inaugural ceremony being conducted in the presence of President Diaz, most of the Mexican ministry, and the foreign diplomatic body. The first vessel to pass through to the transhipment station was the *Arizonan*, of the American-Hawaiian line. Though the distance from port to port is only 125 miles, the

distance by rail is 190 miles, owing to the physical difficulties that had to be coped with. The railway is a triumph of engineering construction and cost altogether £6,000,000. The lines from Vera Cruz and Salina Cruz meet at Santa Lucretia Junction, near the bridge over the Jaltepec, the principal bridge (560 feet long and composed of five spans) on the system. The route has some distinct advantages over the Panama Canal, as the following table of distances shows, and the start of many years was decidedly in its favour :—

Distances—Nautical Miles.		From	To
		Tehuantepec.	Panama.
From New York	to San Francisco	4,226	5,495
"	" Acapulco	2,363	3,613
"	" Mazatlan	3,017	4,035
"	" Yokohama	8,666	9,835
"	" Honolulu	5,699	6,888
From New Orleans	to San Francisco	3,091	4,700
"	" Acapulco	1,262	2,861
"	" Mazatlan	1,750	3,458
From Liverpool	to San Francisco	7,182	8,038
"	" Acapulco	5,274	6,035
"	" Honolulu	3,511	4,263
"	" Yokohama	11,478	12,500

Teignmouth, a watering-place of Devonshire, England, at the mouth of the Teign, 14 miles S. of Exeter. It was ravaged by the Danes in 970, raided by the French in 1338 and 1690 and gives the title of Baron to the Shore family. The fisheries are the leading industry, but brewing, malting and ship-building are carried on, and potters' clay and pipe-clay are dug in the vicinity and shipped to the Potteries. It is an attractive-looking town and enjoys a very considerable reputation as a holiday and health resort. Pop. (1901), 8,636.

Telegraph, in a general sense, means any apparatus for conveying intelligence to a distance by means of signals, but although systems of signalling by flags, guns, semaphores, etc., may properly be designated telegraphy, yet the term is to a large extent restricted to methods depending upon the use of electric currents. The fact that an electric charge communicated to one end of a wire could be made to produce a visible signal at the other suggested the idea of an electric telegraph in 1753, but it was not until the principles of electro-magnetism were to some extent understood that any practical device was produced. The deflection of a magnetised needle by a coil conveying a current was proposed by many, and developed by Sir William Fothergill Cooke and Sir Charles Wheatstone. Five needles and as many wires were at one time used, but these were reduced to one (1845); and the single-needle instrument so developed is still employed to a large extent for railway purposes. Another type of instrument, depending upon the temporary attraction of an electromagnet for its armature, was invented by Samuel Finley Breese Morse in America in 1835-7, and this, having received many improvements in detail, is now generally employed for land telegraphs. In 1840 Wheatstone devised his "step-by-step" or A B C instrument (now superseded), which formed the basis of the type-printing instrument used for distributing items of news. A tele-

graph system consists of a "line" or wire connected at each end to suitable transmitting and receiving apparatus. In the case of land lines, the wire may be suspended in the air from poles or may be drawn into underground pipes. A single wire only is used to connect each pair of stations, the earth serving for a return conductor, and hence it follows that the line must be insulated as perfectly as possible from the earth. The wire—generally of galvanised iron—is therefore supported upon insulators of vitrified and glazed porcelain, shaped in such a way that some part may be as far as possible protected from wet and dust. Underground wires are of copper, covered with a coating of guttapercha, protected by a lapping of tarred tape, and are drawn into iron pipes placed under the pavements. In a submarine cable a strand of small copper wires is used and very carefully covered with several layers of guttapercha. It is mechanically protected by being lapped with jute yarn and is armoured with spirally-laid galvanised steel wires, the armouring of the parts near the shore being much heavier than that of the deep-sea portion. As a source of electricity, galvanic batteries [BATTERY] (Daniell's, Fuller's, etc.) are generally used, but in large offices, where the work is heavy, secondary batteries are found more economical and more trustworthy. The transmitting instrument consists of some form of key which reverses or interrupts the current in accordance with the motions of the operator's hand; and when a message is not being sent, the key must make such contacts that a current from the distant station flows to the receiving instrument. Of the many possible forms of the latter the Morse "Sonder" and "Recorder" are most generally used for land lines. The sonder consists of an electromagnet, with an armature attached to a pivoted brass lever, normally held against a stop by a spring. One end of the magnet winding is connected to "line" through the key, the other to "earth." When a current is received from the line, the armature is attracted and, by coming into contact with a stop, makes a sharp click; and on the cessation of this current it is pulled away by its spring and, striking another stop, makes another click. If the key at the sending end is only depressed for an instant, these clicks will follow in quick succession; but if the operator holds down the key for a slightly longer time, there will be an interval between the two sounds. The recorder is similarly constructed, but the pivoted lever is prolonged and carries at its end a small wheel, whose edge is kept wet with ink by means of a roller. A strip of paper is moved over this wheel (but not in contact with it) by a clockwork mechanism, and when the armature is attracted by the magnet the wheel is lifted and touches the paper. A mark is thus made and the length of this mark depends upon the length of time during which the armature is attracted—that is to say, upon the time during which the sender depressed his key. If he just closes the circuit and immediately opens it, the result will be a very short mark or "dot," or he may make a longer mark or "dash"; and it is by various combinations of dots and dashes that various letters are indicated. The

sounder, of course, makes no visible signal, but the difference between a dot and a dash is easily perceived by the ear. The single-needle instrument is a special form of galvanometer with a vertical needle. If the sending operator, by means of a reversing key, puts the positive terminal of his battery to line, the distant needle will be deflected, say, to the right; if he puts the negative to line, the needle will deflect to the left. If a deflection to one side is regarded as equivalent to a dot and a reverse deflection to a dash, the system of signals or Morse code mentioned above can be used. This instrument is convenient in many ways, but in regard to speed it is much inferior to the Morse, and in the case of lines joining large towns speed is a matter of great importance. With the Morse recorder the speed is limited by the quickness with which the operator can move his fingers and in order to send the greatest possible number of messages over a single line Wheatstone's automatic system is often used. Here an automatic transmitter is used instead of a key. By means of a special machine holes are punched in a strip of paper, the position of these holes depending upon the signal to be sent, and this strip is drawn by clockwork through the transmitting instrument. Certain pins are arranged to be able to pass through the holes in the strip and by so doing make the contacts needed for sending the message. A number of operators may at the same time be punching strips which are successively sent through the same instrument, and by this means as many as 400 words a minute may be transmitted over one wire. Much more delicate receiving apparatus is needed for submarine work than for use on land lines. Sir William Thomson's (Lord Kelvin's) mirror galvanometer was originally employed for this purpose, being used in the same way as a single-needle instrument, but it was superseded by his siphon recorder. In the latter instrument the moving part is a small light coil of fine wire suspended between the poles of a powerful magnet and connected with the circuit. A current in this coil will cause it to deflect to one side or the other, according to its direction, the arrangement being, in fact, a form of electric motor. This coil is connected by silk threads to a siphon of fine glass tube, which, as the coil deflects, is moved over the surface of a strip of paper propelled by clockwork. One end of the siphon dips into a pot of ink and, either by electrifying this ink or by causing the paper and siphon to be continuously vibrated, the ink is made to come from the far end of the tube in a succession of fine drops. A line is thus made on the moving paper, which wanders to one side or the other of its middle position when a positive or negative current comes from the cable, and this line is read in the same way as are the deflections of a single-needle instrument.

Telegraphy, Wireless. [WIRELESS TELEGRAPHY.]

Tel-el-Kebir, a village on the southern border of the Delta, Egypt, roughly about midway between the Nile and the Suez Canal, 40 miles N.E. of Cairo. It was the scene of the battle between the British

forces (15,000 strong) and the army of Arabi Pasha (38,000 strong and 60 guns) on September 13th, 1882, when the latter was overwhelmed. The losses in killed and wounded on the side of the victors amounted to 459 and on that of the Egyptians to nearly 2,000. As one result of the success Arabi surrendered and the rebellion was crushed before the month was out.

Telemachus, son of Odysseus or Ulysses and Penelope, was born shortly before his father's departure for Troy. On reaching manhood he set out to seek his father, instigated thereto by Athene, who appeared to him in disguise. On returning from his fruitless journey, he found his father at Ithaca in the garb of a beggar and assisted him to slay the suitors who had importuned the faithful Penelope during her husband's prolonged absence.

Telephone, an instrument for transmitting sounds to a distance. Sounds directed upon a diaphragm or stretched membrane cause the latter to vibrate, and if a second diaphragm is connected with the first by means of a tight string or wire attached to the centre of each, the vibrations of one will be communicated to the other. Although speech may be transmitted in this way to a limited distance, the difficulty of guiding the string round corners without interfering with its vibrations renders the arrangement of small importance. It

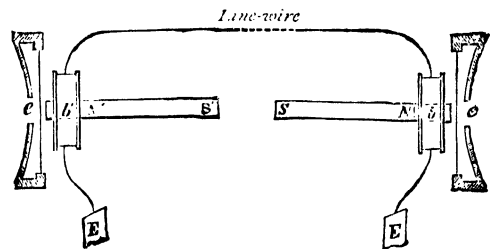
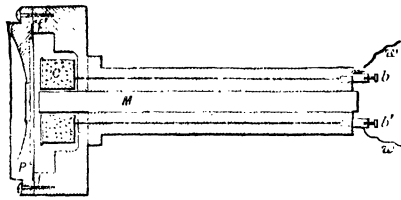


DIAGRAM OF TRANSMITTER AND RECEIVER.

appears to have first occurred to Philip Reis to endeavour to make the vibrations of the one diaphragm produce corresponding changes in an electric current, and to make this varying current produce sounds at the distant end of the circuit. He attached a piece of metal to the centre of a diaphragm of bladder, which made and broke contact with a light spring as the membrane vibrated. It had previously been noted by Page that an electromagnet produces a sound as its circuit is made or broken, and consequently Reis was enabled, by simply leading the intermittent current from his diaphragm to an electromagnet, to reproduce sounds to some extent. But this device did little more than give a sound having the same pitch as the original, whereas, in order to transmit speech, the form of the vibrations must also be retained. In 1874 Professor Alexander Graham Bell began to make experiments in the same direction, and ultimately succeeded in devising a practicable telephone. In this instrument the sound impinges upon a diaphragm of thin sheet-

iron supported round its edge; behind the diaphragm, and opposite its centre, is a short piece of iron surrounded by a coil of fine wire. This iron core forms the pole piece of a steel magnet, and, as the diaphragm in vibration approaches or recedes from it, the resistance of the magnetic circuit is



TELEPHONE RECEIVER.

(P) Mouthpiece, (ff') diaphragm of thin sheet-iron, (M) bar magnet, (c) coil of insulated wire, (b b') screws binding ends of c, (a a') insulated wires from b b' to distant station.

varied and the number of lines of force which pass through the coil suffer a corresponding change. If now the terminals of this coil are connected to the coil of an exactly similar instrument, a current will be generated in the circuit thus formed which will vary in direction and strength in proportion to the motions of the iron diaphragm. But as this current also circulates in the coil of the second instrument the strength of its magnet will be varied, and its iron diaphragm will be attracted more or less strongly, in accordance with the variation of the current and the motion of the diaphragm of the first instrument. It will thus vibrate in a way which is almost an exact reproduction of that of the transmitting instrument, and any sound will be reproduced with considerable accuracy though with some loss in loudness. In order to overcome this last drawback Reis's transmitter was revived in a modified form by Edison, Hughes, Berliner, and many others. In all these carbon transmitters or microphones the vibrations of a diaphragm are caused to vary the resistance of the circuit, instead of making and breaking it, as Reis's did. Two conductors—either both of carbon, or one of carbon and one of platinum—are placed loosely in contact, and it is found that vibrations communicated to such a contact cause its resistance to vary. By placing a battery in the circuit a current which varies with the sound-vibrations is obtained, and such an arrangement used in conjunction with Bell's instrument as a receiver constitutes the modern telephone. The resistance of a carbon transmitter is not very high, and if placed in a series with a long line of wire would form but a small portion of the resistance of the whole circuit; hence even a large variation in the resistance of the contact would produce a small change in the total resistance, and therefore in the current. It is consequently found better to connect the microphone and battery, not to the line, but to the primary winding of a small induction coil (the resistance of which is low), and to connect the line to the secondary winding. In this way a fairly strong current in the primary circuit is con-

verted into a current of much higher potential, suited to overcome the line resistance. In a telephone exchange system wires from each subscriber's instrument are taken to a central office or exchange, and arrangements are made for connecting any subscriber with any other. This system is further extended by connecting the exchanges in various towns by trunk lines. In the first telephone systems erected, single lines, with earth returns, were used, and from this many troubles arose. If a telegraph wire runs parallel and near to a telephone wire, the currents in the former induce currents in the latter, and various return currents are apt to get mixed; further, messages may get from one wire to another by induction or leakage, and the efficiency of the telephone service is very much reduced. The remedy for these evils is to use a second wire as a return, and in places liable to induction, to cross the wires at certain points, so that the average distance of the two wires from the source of disturbance is the same. [POST OFFICE.]

Telescope (from two Greek words meaning "to view afar") is employed as a means of enabling us to see magnified images of very distant and apparently minute objects. Telescopes may be divided into two classes: (1) those in which the first image is produced by a lens—these are known as refracting telescopes; (2) those in which this image is produced by a concave mirror—these are known as reflecting telescopes.

The simplest of the refracting instruments is the astronomical telescope. This consists of a convex lens or object-glass *O*, and a convex eye-piece *E*. If a very distant object *A C B* be viewed through this telescope, each point in it will send parallel rays to the lens *O*. The parallel rays from *A* will converge to the point *a*, and those from *B* will converge to *b*. A real inverted image *a c b* will thus be formed of the object *A C B*, and this image will be at the principal focus of the object-glass. The image *a c b* can now be considered as the object viewed by the lens *E*, and if *E* be adjusted so that its distance from *a b* is rather less than its own focal length, a virtual image *a' c' b'* will be formed larger than *a c b*, and further away from the lens. This enlarged image will be viewed by the eye placed behind *E*. In the diagram (Fig. 1), to avoid confusion, only those rays are drawn which are parallel to the axis and are sent out by the point *o* in the object. The dotted lines indicate that the rays do not actually pass through *e'* but only appear to come from that direction. The distance between the two lenses is almost exactly the sum of their focal lengths, and the magnifying power is their ratio. In practice the lenses are mounted in tubes, and may be brought nearer together or farther apart to suit the convenience of the observer, and to be adjustable for viewing terrestrial objects, which are not, of course, always equally far off. The size of the object-glass determines the amount of light which shall enter the eye, and this must be so great in order to get a sufficient illumination of a very large image that it practically fixes a limit to the amount of magnification obtainable, or at least introduces enormous difficulties in the way of

obtaining extremely high magnification. In astronomical observations the inversion of the image is not of any importance; but when terrestrial objects are viewed it is not, as a rule, desirable to see them upside down. To avoid this, two equal convex lenses are often placed between ab and E ; this reinverts the image which is seen through E , so

is replaced by a large concave mirror or speculum, which forms the image to be viewed by the eye-piece. In Sir Isaac Newton's telescope (Fig. 2), rays from a distant object AB are reflected from the concave mirror S , and would form a real inverted image at ab ; these rays are, however, reflected by a plane mirror M placed across their

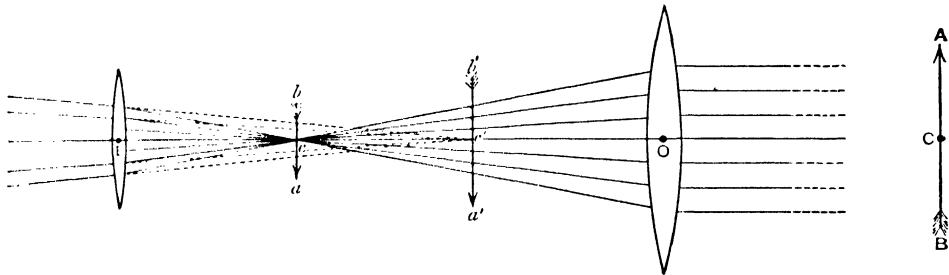


FIG. 1.—REFRACTING TELESCOPE.

that the final virtual result is erect. Other arrangements may be used instead of the convex lenses to produce the same effect. In the Galilean telescope inversion of the image is avoided by the substitution of a concave for the convex eye-piece (Fig. 3). Rays from the object would, after passing through the object-glass O , naturally form the real inverted image ab ; the rays are, however, confronted on their way by the lens E , placed at a distance rather more than its focal length from ab , which makes them more divergent. The outer ray $a'b$ is bent upwards into the eye, to which it appears to have come from a point b' , while the ray $O E$ is turned so that it seems to have come from a' . The virtual image $a'b'$ is therefore erect. The magnification, as before, is the ratio of the focal length of the object-glass to that of the eye-piece, while the distance between the two lenses is the difference

path, so that the image is formed at $a'b'$ instead. Viewed by an eye-piece E , this last image appears magnified at $a''b''$. The magnifying power is expressed by the ratio between the focal lengths of speculum and eye-piece. In the Gregorian—the first reflecting telescope to be invented—the speculum contains a circular hole in its centre; it forms a real image in the same position as ab in the Newtonian telescope (Fig. 2). A second but small concave mirror, suspended in the centre of the tube, with its back to the light, forms a second real image in front of itself. This image, being the inversion of the first, is erect with regard to the object. The second mirror is so placed that the second image falls near the aperture in the centre of the speculum; an eye-piece placed behind the hole is then used as a means of magnifying it again. The magnifying power is approximately equal to the ratio between the square of the focal length of

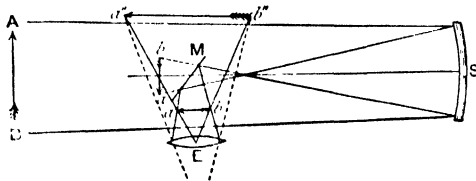


FIG. 2.—NEWTON'S TELESCOPE.

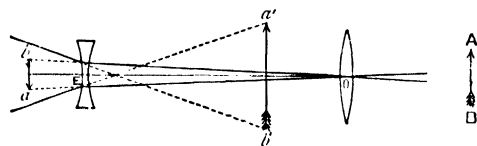
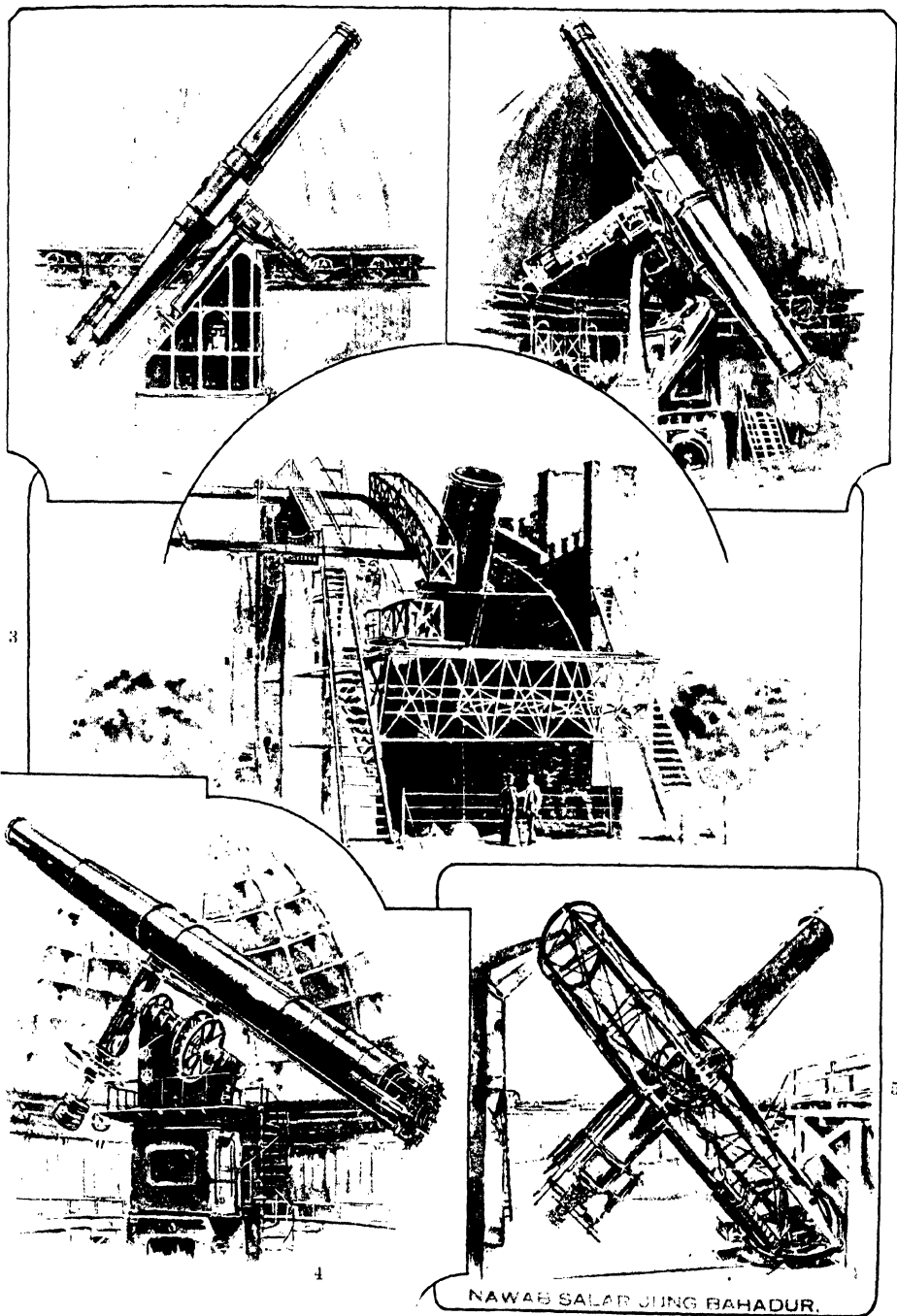


FIG. 3.—GALILEAN TELESCOPE.

of their focal lengths. This makes it a much more convenient size for ordinary use, and hence opera- and field-glasses are constructed on this principle, they being, in fact, merely a pair of Galilean telescopes. It is usual to make both object and eye-piece achromatic by using compound lenses, the component parts being of different kinds of glass. The Galilean telescope could not be used for measuring the exact position of an object, for cross lines would be ineffective, since there is no real image formed with which they could coincide.

In reflecting telescopes, the convex object-glass

is replaced by a large concave mirror or speculum, which forms the image to be viewed by the eye-piece. Cassegrain's differs from Gregory's telescope in that the first image ab is not actually formed; the rays are intercepted by a convex mirror, which forms an image, as before, near the aperture in the speculum, and this is viewed by a similar eye-piece. The distance of this convex mirror from the position which ab would occupy is rather less than its focal length. The approximate magnifying power is expressed by the same ratio as that which held for Gregory's. This telescope has the advantage of being shorter than Gregory's and of partially correcting spherical



TELESCOPES.

1 Dunsink Observatory Telescope. 2 Vienna Observatory Telescope. 3 Lord Rosse's Telescope. 4 Lick Observatory Telescope. 5 Greenwich Observatory Telescope.

aberration; but for terrestrial observation it is not so convenient, since it gives an inverted image of the object.

Most telescopes are provided with a compound eye-piece, the usual form being that invented by Huyghens. This consists of two convex lenses, the focal length of the one farthest from the eye being three times that of the other, while the distance between the two is the difference of their focal lengths.

Achromatic refracting telescopes give much brighter and more distinct images than are obtained from similar reflectors, but the difficulties in the way of making large object-glasses are enormous. The necessary thickness of the lens makes it very liable to have stresses and strains set up inside it, so that the path of some of the rays is distorted and the image is blurred. Specula, on the other hand, can be made enormously big; Sir William Herschel's speculum, in fact, was so large that he could directly view with an eye-piece the real image formed by it. His face was thus turned directly towards the speculum, the fact that his head was in the path of the initial rays not causing any serious interference.

The famous reflecting telescope of Lord Rosse, erected in 1844, has an aperture of 72 inches, while that of the largest refractor—that in the Yerkes Observatory at Chicago—measures 40 inches. The refracting telescope at Greenwich has an aperture of 28 inches.

Telford, THOMAS, civil engineer, was the son of a shepherd at Westerkirk in Eskdale, Dumfriesshire, where he was born on August 9th, 1757. He was educated at the parish school and, after serving as a herd laddie, was apprenticed to a stonemason, and removed to Edinburgh in 1780 and to London in 1782. In 1787 he became surveyor of public works for Shropshire. His chief works are the Ellesmere Canal (1793-1805), the Caledonian Canal (opened in 1822), the road from London to Holyhead (completed in 1815), the Menai Suspension Bridge (1819-26), the St. Katherine's Docks in London (1826-8), the Dean Bridge in Edinburgh (1831), and the Broomielaw Bridge in Glasgow (1833-5), besides the harbours of Wick, Aberdeen, Peterhead, Banff, Leith, and Dundee. He died in Westminster on September 2nd, 1834, and was buried in the Abbey.

Tell, WILLIAM, a legendary Swiss patriot, whose story is thus given in the revised version (1734-6) of the *Chronicle* of *Ægidius Tschudi* (1505-72):—On November 7, 1307, representatives from the forest cantons of Schwyz, Uri and Unterwalden, exasperated by the Austrian tyranny, had met together on the Rütli Meadow and fixed a day for a general rising. Each leader was attended by ten companions, Tell being present among those from Uri. The most overbearing of Albert II.'s *vogts*, or bailiffs, was Gryssler or Gessler, who dwelt in the castle of Küssnacht, at the north extremity of the Lake of Lucerne. This official fixed the ducal hat of Austria on a pole in the market-place of Altdorf, threatening punishment to all passers-by who failed to salute it. Tell and

his little son disobeyed the mandate and were condemned to death; but a hope of escape was held out to them if the father, a noted archer, could hit an apple placed on his boy's head. Having accomplished this feat (November 18), Tell had the boldness to confess to Gessler that if his son had been killed the bailiff would have perished also. Thereupon he was seized by Gessler and carried off in a boat to his castle; but on the way a terrible storm arose and Tell, the strongest man of the party, was placed at the helm. He steered the boat to a ledge of rock, known afterwards as Telles Platte, and, springing ashore, slew the tyrant with his cross-bow. Hastening back to Uri, he stirred up his countrymen and on the appointed day the rising took place, leading to a war which ended in the formation of the Swiss Confederation. The story of the apple is first found in a ballad, the earlier portion of which was probably written about 1470. The subsequent events were taken from the *Chronicle* of Melchior Russ, of Lucerne, written in 1482 and the following years. Ulrich Freudenberger (1712-70) was the first who detected the similarity of the story to a Danish myth. It is now known that the main incident is found both in Indo-Germanic and non-Aryan folk-lore, and antiquarian research has shown that there is no ground for believing that the chief actors in the drama are historical persons.

Tellinacea, a group of Lamellibranchiata, includes those forms with two adductor muscles (those by which the two valves of the shell are closed), a single pair of gills, long separate siphons and a large foot. *Tellina*—the type-genus—is common in all seas, but the finest examples are found in tropical waters. It is able to leap from the surface by means of its muscular foot. It ranges in time from the Cretaceous period onwards.

Tellurium (chemical symbol, Te ; atomic weight, 125) is a non-metallic element which occurs naturally both combined and in the free state, but only in very small quantities. The chief localities where the element is found are California, Hungary and Brazil, and its chief compounds are its combinations with the metals silver, gold and bismuth. When obtained pure, it is a white metal-like substance, which may be obtained in crystals of the Hexagonal system. It melts at about 500° and distils at a higher temperature. It possesses a specific gravity of about 6.25. If heated strongly in air, it burns with a blue flame and forms an oxide, TeO_2 , which comes off as thick white fumes. The element is insoluble in acids, except strong sulphuric acid, in which it dissolves to a deep-red solution. Chemically it resembles in many particulars the non-metals sulphur and selenium. Thus it forms a hydride, TeH_2 , possessing a very disagreeable odour closely resembling that of sulphuretted hydrogen. It forms two oxides—a dioxide, TeO_2 , and a trioxide, TeO_3 —both of which combine with bases to form salts, the tellurites and tellurates. The lower oxide also possesses basic properties itself, forming unstable

salts with strong acids. The tellurates are for the most part insoluble, many of them being remarkable as existing in two modifications which differ in colour, solubility and other physical properties.

Telpherage is a form of light electric railway devised by Fleeming Jenkin in 1882, which was suggested to him by the description of the electric railway block system of Professors W. E. Ayrton and John Perry. A single wire suspended in the air on posts supports a series of pendent trucks, whose framework is bent so as to bring the centre of gravity of the load under the wire. This train is propelled by an electro-motor, a current being conducted to it by the line wire by a variety of ingenious devices. Such a line was erected at Glynde, in Sussex, but the inventor (d. 1885) did not live to see it in operation.

Telugu, the largest division of the Dravidian race, Southern India [DRAVIDIANS], whose domain comprises the Northern Circars, parts of Mysore and of the Nizam's territory, and the eastern seaboard generally from about the parallel of Madras to Orissa, with a total population of over 20,000,000. They are also numerous in Singapore, Penang and other parts of Malaysia, where all the Hindu immigrants from India are commonly called Klings, a contracted form of Telinga or Kalinga, as the Telugus are called by their neighbours of Sanskritic speech. They are the "Gentoos," *i.e.*, Gentiles, of the early Portuguese and English writers. Their copious and soft language, the "Italian of the East," has long been cultivated under Hindu influences, and the Telugu translations of the great Sanskrit epic poems date from the 12th century. The Telugu literature is also rich in original works, chiefly poetry, myths, proverbs and tales. It employs a variety of the Grandonic Alphabet, more fully developed and of rounder form than the Tamil. From the fact that Sanskrit writers call the Telugu language Andhra, Indian scholars have identified the Telugu people with Ptolemy's *Andra Indii*, dominant in the ancient kingdom of Telingana in Central and East India.

Temesvar, a royal free city of Hungary, on the Bega Canal, 160 miles S.E. of Budapest. The town proper contains a fortified citadel, and there are several suburbs. Among the chief buildings are the 18th-century Catholic Cathedral, the Greek Church, the Arsenal (lodged in the much-altered castle erected in 1442 by Hunyady) and the Greek bishop's palace. The principal products are beer, flour, tobacco, cloth, silk, paper, leather, wool and oil; and there is a considerable trade in grain, wax, honey and brandy from Servia, Transylvania and Rumania. In 1849 the Hungarian rebels besieged it for more than three months, General Haynau eventually relieving it. Pop. (1900), 53,933.

Temnechinus is an interesting genus of Sea-urchins or Echinoidea, belonging to the family Temnopleuridae. The shell or test has numerous grooves or pits along the sutures; but, as these are only "false pits," the genus belongs to the sub-family Glyphocyphinae. Specimens of the genus are common in the Crag deposits of Suffolk, where

two species occur; one of these is found also in beds of the same age in Belgium, and a living species occurs in the Azores and West Indies. In addition to its distribution, the genus is interesting as one of the few sea-urchins which are viviparous and do not pass through a metamorphosis. The young are protected in "marsupial pouches."

Temnopleuridae, a family of Sea-urchins belonging to the order Diadematoida and including those forms which have the mouth situated on the centre of the lower surface and the anus opposite to it. The mouth is armed with jaws and along the sutures between the plates of the test are numerous pits or grooves. The former occur in the sub-family Temnopleurinae and the latter in Glyphocyphinae. The family is now widely distributed, includes twenty-two genera and ranges from the Cretaceous period onwards.

Temperament. A vocalist singing a simple diatonic major scale will produce notes whose vibration frequencies bear a definite fixed relation to each other, independent of the key-note. These frequencies are proportional to the numbers 24, 27, 30, 32, 36, 40, 45, 48. Thus, if we take the middle *c* (*c'*) as our key-note and accept 256 as its number of vibrations per second [PITCH], we shall have the following scale—



Then will follow the octaves of these notes, thus *d''* = 576, *e''* = 640, *f''* = 682.6, *g''* = 768, etc. This is a naturally tempered scale, and will be produced by the voice or the violin—in fact, in any case where the note is controlled by the ear. A singer will feel that these notes are the correct ones in such a key, that they are perfectly in tune and that the whole effect is harmonious. In the same way, if the vocalist produces the scale of *g'*, starting from *g'* = 384, the vibration frequencies will be

<i>g'</i>	<i>a'</i>	<i>b'</i>	<i>c''</i>	<i>d''</i>	<i>e''</i>	<i>f''</i>	<i>g''</i>
384	432	480	512	576	640	720	768

So long as the notes are entirely made by the producer, as in the case of an unaccompanied singer, no difficulty will arise from the fact that the *a'* is not the same in each scale. But when we are dealing with an instrument whose notes are already formed the case is different. If we gave each scale in turn, we should discover that new notes have constantly to be introduced, many of them differing not very greatly from those already obtained, but sufficiently so to produce an unpleasant effect on a good ear when the one is substituted for the other. On an instrument, such as the piano, where the notes are fixed, it would be impossible to have a number sufficient to suit all scales. The natural scale is therefore modified and intermediate notes are introduced, making

thirteen from one note to its octave inclusive. There are hence twelve intervals and these are made of equal value. The vibrations of any note multiplied by $2^{\frac{1}{12}}$ give the vibrations of the note immediately following it. Such a scale is known as one of equal temperament. The result is not agreeable to a very refined ear, which can detect the sharpness of the thirds and other differences, but custom has trained most ears into an involuntary acceptance of the tempered note as the true one.

Temperance. The temperance movement may be regarded as a product of the newly-developed tendency to combine in associated efforts for the advancement of social and moral progress that formed a marked characteristic of the first quarter of the 19th century. The effects of excessive drinking had been frequently pointed out by earnest-minded doctors, judges, magistrates, public men and divines, who denounced it as a curse to society, and isolated efforts at reformation were put forth by a few persons who, for diverse reasons, refrained from partaking of intoxicating liquors; but it was not till 1826 that an organised movement for the suppression of intemperance was initiated in the United States, where it spread with remarkable rapidity and gained a permanent hold on the sympathies of the people. Tidings of the new movement reached Great Britain in 1828, and in the following year temperance societies were formed simultaneously in Scotland and Ireland by enthusiastic converts, who were at the time totally ignorant of each other's proceedings. The first English temperance society was established in 1830 at Bradford, Yorkshire, by a commercial traveller who had attended a meeting in Glasgow, and the same year witnessed the formation of similar societies at Warrington, Liverpool, Manchester, Bristol and other towns, the agitation being at the same time vigorously carried forward in Scotland and Ireland. Early in 1831 the movement reached the metropolis, where the British and Foreign Temperance Society was formed, chiefly through the earnest and persevering exertions of Mr. (afterwards Sir) William Collins, of Glasgow, stationer, printer and publisher. All these societies were based upon the principle of abstinence from distilled, spirits with permission to use malt liquors and alcoholic wines in moderation; but their influence upon the public mind was comparatively limited, and it was not until the advantages of teetotalism were promulgated in 1832 at Preston, that anything like enthusiasm was manifested in behalf of temperance reform in England. The leader of the Preston crusade was Joseph Livesey (1794-1884), who began the *Preston Temperance Advocate* in 1834 and, after two visits to London, succeeded in 1835 in forming the British Teetotal Temperance Society, which was absorbed in 1836 by the New British and Foreign Temperance Society, also a teetotal organisation; and this, after a series of modifications, eventually developed in 1856 into the National Temperance League, whose headquarters are now in Paternoster Row, London. In the meantime the movement had been

spreading throughout the United Kingdom, and hundreds of local societies came into existence. What is now known as the British Temperance League was formed at Manchester in 1835. The Western Temperance League was founded in 1837; the Scottish Temperance League in 1844; the United Kingdom Alliance in 1853; the United Kingdom Band of Hope Union in 1855; the Midland Temperance League in 1856; the North of England Temperance League in 1858; the Irish Temperance League in 1859; and the Church of England Total Abstinence Society in 1862, its reorganisation under the dual basis (one teetotal, the other temperance, the former being admittedly the more effective) taking place in 1873. The Central Sunday Closing Association was reorganised in 1866, and the Independent Order of Good Templars was introduced into England in 1868; whilst the British Medical Temperance Association and the British Women's Temperance Association were instituted in 1876. Other organisations such as the Blue Ribbon Army (1878), Gospel Temperance Association and innumerable Bands of Hope sprang up from time to time and swelled the tide of temperance influence; the conferences, conventions and other gatherings being carried on with dauntless vigour and genuine enthusiasm. The work of Father Mathew—begun in 1838 and continued for several years—produced a powerful impression not only in Ireland, but in other parts of the British Isles, where, as in the United States, "Father Mathew" societies are still flourishing. The repeated visits to the United Kingdom of Mr. John Bullantine Gough, the American lecturer (who was, however, a native of Sandgate in Kent, where he was born on August 22nd, 1817; he died in Philadelphia on February 18th, 1886), were the means of securing many fresh adherents amongst all classes, and the persistent labours of other advocates were of inestimable value in enlisting public sympathy, while the extensive circulation of books, pamphlets and tracts has been of immense service in extending and consolidating an enterprise the success of which largely depends upon the diffusion of trustworthy information. Amongst books devoted to the cause are Dr. Dawson Burns's *Temperance History* (National Temperance Publication Depot), *The Temperance Movement and its Workers*, by Mr. Winskill (Blackie and Sons) and the *Temperance Reader*, by J. Dennis Hird (Cassell and Company); while the *Annual* of the National Temperance League contains a summary of current facts and statistics, compiled from parliamentary papers and other official documents. The organs of the movement include the *Temperance Record* (National Temperance League), the *Temperance Chronicle* (Church of England Temperance Society), the *Alliance News* (United Kingdom Alliance), the *Good Templars' Watchword*, the *Temperance Leader* (Scottish Temperance League), *On the Line* (United Kingdom Railway Temperance Union), *On the March* (Royal Army Temperance Association), and the *Scottish Reformer* (Scottish Permissive Bill and Temperance Association); and there is also a large number of monthly periodicals representing different localities, and dealing with the multifarious aspects of the temperance question.

It is easier to describe the progress than to tabulate the results of temperance reformation. What in the United Kingdom is familiarly known as the "Drink bill" (or account), large as it is (between 160 and 170 millions a year), would undoubtedly have been much larger had no effort been made to check the growth of drinking habits, and there are many indications that the labours of the early teetotalers have met with a gratifying degree of success. The refusal of an insurance company to accept a proposal from a healthy teetotaler, except at an advanced premium, led to the formation, in 1840, of the United Kingdom Temperance and General Provident Institution, which has demonstrated in a remarkable way the superior longevity of abstainers as compared with moderate drinkers; and the experience of the London Temperance Hospital, established in 1873, conclusively shows that alcohol is rarely necessary in the treatment of disease. The leaders of the medical profession have emphatically declared that "the most perfect health is compatible with total abstinence from intoxicating beverages," and that "alcohol, in whatever form, should be prescribed with as much care as any powerful drug." The Churches, which at first opposed teetotalism, on the ground that it was an unscriptural remedy for intemperance, have gradually come to recognise it as a powerful and indispensable ally, and it is believed that from 50 to 80 per cent. of the Non-conformist ministers in Great Britain are abstainers, whilst many bishops and clergy of the National Church are to be found in the foremost ranks of earnest temperance reformers. Instruction in temperance matters, encouraged by School Boards and the Education Department, is a prominent feature in many elementary schools, and the subject is also receiving constant attention in training colleges, universities, and other educational institutions. In the British army a Temperance Association was formed in 1893, under the sanction of the highest military authorities, and a similar work has been carried on for several years in the Royal Navy by the National Temperance League, which has a branch on board every commissioned ship in His Majesty's service. Temperance men are found in large numbers in Parliament, Town and County Councils, and other representative public bodies; and the remarkable extension of admirably-equipped tea-shops and temperance refreshment rooms in London and other prominent towns shows that the attempts to establish effective rivals to the public-house are warmly appreciated by an enormous number of the general public. The numerous legislative efforts to diminish intemperance have not yet been attended by much success, which would appear to support the contention of those who hold with the Apostle that "faith without works is dead" and that, after all, it is practice not precept which counts. The Beer Act of 1830 and the Refreshment Houses and Wine Licenses Act of 1860, although sincerely advocated by their promoters as ameliorative measures, have tended to increase and intensify the evil. As early as 1834 the House of Commons appointed a Select Committee to investigate "the extent, causes, and

consequences of national drunkenness," and a similar Committee was appointed by the House of Lords in 1876, but their elaborate reports did not lead to any practical legislation. A Select Committee on the treatment of habitual drunkards, which was appointed in 1872, prepared the way for the imperfect Inebriates Act of 1879, which was slightly improved in 1888 and greatly strengthened by the compulsory powers of the amending Act passed in 1898. In 1891 the House of Lords, in the case of *Sharp v. Wakefield*, decided that licensing justices had the power to refuse to renew publicans' licences whenever they thought proper. In regard to the Sunday closing of public-houses, more progress has been made. The Scottish Act—the so-called "Forbes Mackenzie Act," named after its author—was passed in 1853; the Irish, exempting six large towns, in 1878; and the Welsh Bill became law in 1881. The Permissive Bill, which was first introduced by Sir Wilfrid Lawson in 1864, was practically adopted by the Government in 1893, when Sir William Harcourt introduced his Liquor Control Bill, providing that public-houses, with certain exceptions, may be closed by a local vote of two-thirds of the rate-payers. This, however, was not carried, and in 1896 yet another Commission "to inquire into the operation" of the Licensing Laws was appointed. The Commission took some exception to the proposed draft report of its chairman, Lord Peel, whereupon (1899) his lordship withdrew. His report, however, was not lost, for the minority of the Commissioners practically adopted it and made it their own. It recommended the immediate reduction of a large number of licensed houses, condemned the principle of compensation out of the public rates and urged that compensation should be provided out of a fund created *ad hoc* out of an annual licence-rental on the rateable value of the remaining houses. The Licensing Act of 1904, which came into operation on the following New Year's Day, virtually gave the publican a vested interest in his licence and aroused universal indignation outside of the friends of "the trade." What was held in many quarters to be a thinly-veiled manifesto in the interests of distillers appeared in the *Lancet* of March 30th, 1907, and created a nine days' wonder. It was signed by sixteen well-known practitioners, some of whom afterwards admitted that they would not have signed it had they been aware that the declaration emanated from a layman. The chief clauses of this fatuous document were:—"Recognising that, in prescribing alcohol, the requirements of the individual must be the governing rule, we are convinced of the correctness of the opinion so long and generally held, that in disease alcohol is a rapid and trustworthy restorative. In many cases it may be truly described as life-preserving, owing to its power to sustain cardiac and nervous energy, while protecting the wasting nitrogenous tissues. As an article of diet, we hold that the universal belief of civilised mankind that the moderate use of alcoholic beverages is, for adults, usually beneficial, is amply justified. We deplore the evils arising from the abuse of alcoholic beverages. But it is obvious that there is nothing, however bene-

ficial, which does not by excess become injurious." Three truisms are set forth with portentous gravity, namely (1), that alcohol in disease is a cardiac stimulant; (2) that the moderate use of alcoholic beverages is generally beneficial [in point of fact, however, since the manifesto affects to be a medical pronouncement, it ought to have confessed that no beverage assimilates so well with food as cold water]; and (3) that abuse of alcohol is deplorable. It needed not a Daniel to proclaim these things. No one is concerned about the use of alcoholic beverages. What the manifesto overlooked is the crux of the whole position—were there no abuse of alcohol, there would be no Drink Question.

Temperature. One of the simplest sensations which we experience is that of heat; but our sense of heat is by no means trustworthy. One person may consider a room to be hot, another may say it is cold, and the same person may regard a body as hot or cold, according to his condition. We can arrange certain bodies of different degrees of hotness in a series so that they form a rising scale, and in this way we are comparing them one with another. This, however, would not be very definite; we should not be able to say how much hotter one body was than another. When, however, we have managed to measure the hotness of a body by reference to some standard, we are in a position to speak of its temperature. Bodies of different hotness will exchange heat when in each other's presence—the hotter ones grow cool while the cooler ones become hot. When no further exchange of heat takes place they are said to be at the same temperature. Thus the temperature of a body can be measured if we know the temperature of another body which is in thermal equilibrium with it. The temperature of this standard body is measured by means of one of the effects which are produced in it by heat. One of the most obvious effects of heat is to cause expansion, and so bodies which expand greatly with heat are chosen as standards of reference. If a bulb of glass containing mercury is connected to a tube of fine uniform bore, the mercury will rise in the tube as it is heated more and more. We might then say that equal differences of temperature shall be taken to mean those which produce equal elongations of the mercury column. An arbitrary scale of temperature would then be obtained. But suppose we took a perfectly different liquid from mercury—say, alcohol—and fixed our scale with reference to its expansion only, we should find the two scales did not agree. If the mercury be taken to expand regularly, then equal differences of temperature measured by it do not produce equal elongations in the column of alcohol. Other liquids show similar variations. Which, then, is to be taken as a true standard? Which is to be considered as expanding regularly? This was a problem of considerable importance, and has only been satisfactorily settled in modern times. It is found that all perfect gases agree among themselves, and hence the expansion of one of these has been adopted as a standard—*e.g.* in the air thermometer. A perfectly independent scale of temperature has, however, been evolved from thermodynamical

reasoning; a scale whose absolute zero (-273° of the Centigrade thermometer) corresponds to that given by the air thermometer, and therefore justifies the trust which had been placed in the latter. [THERMODYNAMICS.]

Tempering of Steel, the process by which tools and other things are brought to the requisite degree of hardness or temper. The article is first hardened by heating to redness and sudden cooling in water. It is then "let down" by reheating to a lower temperature. The ultimate hardness depends upon the temperature of this second heating, and this is estimated by observing the colour of the film of oxide which forms upon a part brightened for the purpose. The colours and corresponding approximate temperatures for various purposes are as follows:—Pale straw, 430° F., surgical instruments; straw, 460° , tools for brass and wood and penknives, etc.; brown, 500° , scissors, hatchets, saws; purple, 530° , table knives and tools for soft wood; blue, 580° , swords, axes, etc.; deep blue, 590° , watch springs, needles, saws.

Templars. The Knights Templars were a military order founded about 1118 by Hugues de Payen, Geoffroi de St. Omer, and seven other knights, for the protection of pilgrims to Jerusalem and other sacred sites in the Holy Land. They took the vows of chastity, obedience and poverty before the Patriarch of Jerusalem, and were granted quarters by Baldwin II. in his palace on Mount Moriah, on the site of Solomon's temple, from which the name of the order was derived. At the Council of Troyes in 1128 seventy-two statutes were drawn up and received the sanction of Pope Honorius II. These enactments formed the foundation of the rule as it was finally settled in the middle of the 13th century. During the first hundred and forty years of its existence the number of knights in the Order increased to 20,000 and it became possessed of about 8,000 manors. It was divided into three classes: knights (*armigeri*), chaplains (*clerici*) and men-at-arms (*serrentes*). The knights alone were entitled to wear the white linen mantle with a red cross on the left shoulder. The discipline was extremely severe. At the head of the society was the Grand Master, whose place during his absence was filled by the Seneschal, whilst the various provinces in Asia and Europe were under the direction of masters, commanders, or preceptors. A Papal bull of 1172 exempted the Templars from episcopal jurisdiction and granted them immunity from taxes, tithes and liability to interdict. The animosity excited against them through this measure was increased by their immense riches, their pride and exclusive spirit, and their constant quarrels with the Knights of St. John. When the Templars betook themselves to Cyprus, after the fall of Acre in 1291, it was felt that their task was ended, and the charges of heresy, immorality and impure rites which had been current for some time began to be more boldly circulated. Philip le Bel, the cunning and unscrupulous king of France, perceived that here was an excellent opportunity for recouping his exhausted finances. Jacques de Molai, the Grand

Master, and 140 other Templars were arrested in Paris (1307) and, under the tortures inflicted by the Inquisition, many of the number confessed to the most horrible charges. Philip was supported, though somewhat reluctantly, by Pope Clement V., who owed his position to the French monarch. Owing to his shifty policy, the inquiries and trials were protracted during four years, ending with the abolition of the Order by a bull issued at the Council of Vienne in March, 1312. Two months later their property was handed over to the Order of St. John. Fifty-four knights had already been burned to death in 1310; the remainder were now dealt with by the provincial councils, excepting those of the higher rank, such as the Grand Master, Jacques de Molai, who was burnt by the king's command, without waiting for the Pope's verdict, in 1314. The Order was at the same time suppressed in England, Spain, Portugal, Italy and elsewhere, but in circumstances of less barbarity than those which attended its dissolution in France.

Temple, the building in which a god is supposed to dwell. The word (Latin *templum*, akin to Greek *temenos*, from the root *tem*, "cut off") originally denoted a sanctuary, but its meaning was afterwards narrowed so as to cover only the edifice erected on a sacred spot. Owing to the connection of the æsthetic impulse with religious sentiment, the development of temple architecture is important in the history of ancient art. [GREEK ARCHITECTURE.] The temple of Solomon possesses a peculiar interest for those who have inherited the religious beliefs of the Jews. In common with most, or at least very many, ancient temples, the *beth elokim* ("house of God") or *hekal* of Jehovah comprised an adytum, inner sanctuary, or "oracle," and an ante-chamber, with an altar before the door of the building. The adytum was a cube of twenty cubits (thirty feet), whilst the ante-chamber measured forty cubits in length, twenty in breadth, and thirty in height; in front of it ran a portico of the same breadth with a depth of ten feet. In the adytum was placed the ark, just as in heathen temples it contained a statue of the deity, or some other token of his presence. As the temple was built by workmen from Tyre, a city far in advance of the Hebrews in the arts of civilisation, it is not surprising that it reproduces many of the features of Tyrian architecture. Thus, the walled court (in Solomon's temple there were two, an inner and an outer), the palm-tree, and the cherub which recur so frequently in the ornamentation of the interior, and the cherubs with outstretched wings which overshadowed the ark, can all be traced to Phœnician sources. The building is supposed to have terminated in a high-pitched gable, with three storeys of small chambers on each side and at the back. There were probably square-headed windows either above these chambers or in the gable itself. The portico may have been flanked by tall slender turrets, and it is known that there were detached columns of bronze on each side of the entrance (1 Kings vii. 15, *seq.*). The temple of Zerubbabel, completed after constant interrup-

tions in 520 B.C., stood on the site of Solomon's; it was a much less splendid edifice, but the size was probably as large or even larger. The rebuilding of the temple by Herod occupied a period of eighty years (from about 19 B.C. to A.D. 63). It covered a quadrangular plateau, the area of which, if Josephus may be believed, was twice that of the original structure. He describes it as six stadia in circumference, the Antonia or citadel rising above the general level on the north side. Within the outer court, or Court of the Gentiles, which was not holy ground, there was an inner court, divided by a wall into the Court of the Women and the Court of the Men, in the midst of which, at the summit of a flight of twelve steps, stood the sacred building. The space immediately surrounding the temple and altar, known as the Court of the Priests, was separated from the adjoining ground by a low fence of stone. The temple and its precincts were wholly consumed by fire when the city was taken by Titus in A.D. 70.

Temple, THE, an area in the City of London, lying between Fleet Street on the north and the Thames Embankment on the south, half a mile west by south of St. Paul's Cathedral. It is the seat of the two Inns of Court known as the Inner Temple and the Middle Temple and, in popular estimation, is the headquarters of the legal profession, from the circumstance that most of the chambers are occupied by barristers. The district takes its name from the Knights Templars who, in 1184, removed hither from Holborn, where they had established themselves in 1128, ten years after the foundation of the Order. When the Order was suppressed in 1312, the property was acquired by Aymer de Valence, Earl of Pembroke, and ten years afterwards passed to the Knights Hospitallers, by whom the premises were leased to students of the Common Law. On the dissolution of this Order at the Reformation the estate fell to the Crown, but the buildings were still tenanted by the Inner and Middle Temples, to the Benchers, or governing body, of which they were granted in perpetuity by letters patent issued in 1608. The most remarkable architectural feature is the Temple Church, founded in 1185 by the Knights Templars and the most beautiful example of the four round churches yet extant in England. It comprises two portions—the Transition round structure, built in imitation of the Holy Sepulchre at Jerusalem, and the Early English choir giving off from it towards the east, only the latter being used for the purposes of Divine worship. The fine western porch and doorway contains some Norman work and the extremely elegant clustered pillars of the round tower are of Purbeck marble. On the floor lie several interesting full-length mail-clad effigies, some of knights and others of William Marshall, Earl of Pembroke, Protector of England during the minority of Henry III., and of his two sons William the younger and Gilbert, both prominent patrons of the Temple. Monuments in the church commemorate John Selden and Edmund Gibbon, while in the small burial-ground on the north is the poor tomb of Oliver Goldsmith. The organ was one

of the best examples of Father Smith's craftsmanship. The incumbent of the pulpit is styled Master of the Temple and among those who have filled this post were Richard Hooker "the judicious," Sherlock, afterwards Bishop of London, and Charles John Vaughan. It is interesting to note that the knighthood which accompanies promotion to the bench is said to be a survival of the class of *armigeri*, or knights, of the old Templar Order, as the serjeants-at-law (now extinct) continued the class of *fratres servientes*, or freres serjens, the men-at-arms of the Order. The Middle Temple Hall, one of the handsomest Elizabethan structures in London, has a hammer-beam roof and richly-carved screen and has witnessed all manner of festivities from the masques and revels of the Stewart era to the riotous orgies of a call night. Its Library dates from 1861. The Great Fire, fortunately, stopped short of the Temple, though the Church was almost within reach of the flames. Another fire a few years later destroyed the original Inner Temple Hall, which was almost entirely rebuilt in 1816. The Temple has been commemorated by Chaucer, Shakespeare, Spenser, Dr. Johnson, Goldsmith, Charles Lamb, Dickens and Thackeray, to name only a few of the many great men, some of whom lived within its walls, who have fallen under its spell. The spacious gardens and the cheerful fountain, beloved of Cockney sparrows, still afford a pleasant retreat to the wayfarer anxious to escape for a brief while the strife and tumult of Fleet Street.

Temple, FREDERICK, Archbishop of Canterbury, was born at Santa Maura, one of the Ionian Islands, Greece, on November 30th, 1821, and was educated at Blundell's School, Tiverton, and Balliol College, Oxford. He was ordained in 1846, became Principal of Kneller Hall Training College two years later and from 1857 to 1869 was headmaster of Rugby. Having contributed an unexceptionable essay on "The Education of the World" to the volume of *Essays and Reviews* (1860), he suffered the passionate and



FREDERICK TEMPLE.
(Photo: Russell & Sons.)

bigoted criticism that was passed upon that work. Consequently when, in 1869, he was appointed Bishop of Exeter he was subjected to a good deal of abuse and obstruction. Fearless, outspoken, transparently honest and possessed of remarkable

force of character he ignored all detraction and administered his see with a firm and capable mind. In 1885 he was translated to London and in 1896 succeeded Edward White Benson in the Archbishopric of Canterbury. In 1902 he officiated at the coronation of Edward VII. in Westminster Abbey and died at Lambeth on December 23rd of the same year.

Temple, SIR WILLIAM, statesman, diplomatist, and man of letters, was born in Blackfriars, London, in 1628, his father, Sir John Temple (1600-1677), being Master of the Rolls in Ireland. After studying at Bishop Stortford School and Emmanuel College, Cambridge, he travelled in France, Spain, Holland and Germany, joining his father in Ireland on his return (1654). In 1655 he married Dorothy Osborne, whom he had first met on his Continental travels seven years before. He sat for Carlow county in the Irish Parliament of 1661, but removed to England in 1663, and two years later was despatched on a secret mission to the Bishop of Münster. His services were rewarded with a baronetcy (1666), and a few months later he returned to the Continent as English representative at Brussels. In 1668 he negotiated the Triple Alliance between England, Holland and Sweden, to resist the aggression of France, and a few months later became ambassador at The Hague, but was recalled when his work had already been undone by the secret Treaty of Dover (1670) and was finally dismissed in 1671. He now returned to his villa at Sheen and devoted part of his leisure to the composition of his *Essay upon the Origin and Nature of Government* (not published till 1680) and his *Observations upon the United Provinces of the Netherlands* (1672), which at once achieved popularity. He was called from his retreat in 1674 to negotiate the Treaty of Westminster, which put an end to the war with the Dutch. He went a second time to The Hague and took a leading part in the negotiations which resulted in the Treaty of Nimeguen (1678). His diplomatic career closed with his return from the Netherlands in 1679, but he was still an influential politician. At his suggestion Charles II. formed a Privy Council of thirty members on a new scheme, the real business of which soon fell into the hands of Temple and three others. Disgusted at the king's faithlessness and the venality of politicians, he withdrew to his villa at Sheen, the Council having now practically proved a failure. In 1679 he had been elected M.P. for Cambridge University, but on the dissolution of Parliament in 1681 his name was struck off the list of privy councillors. Having acquired an estate near Farnham in 1680, he laid out the gardens in the Dutch style, called the property Moor Park and henceforth devoted himself to gardening. In 1689 Jonathan Swift became his secretary and remained with him in a confidential capacity until Temple's death on January 27th, 1699. During his later years he wrote several essays, which were published in 1680 and 1692. To the second series belonged the essays on Gardening, Heroic Virtue, Poetry and the more famous one on "Ancient and Modern Learning."

Temple Bar, originally the wooden gateway or barrier that separated the City of London from Westminster. After the Great Fire a permanent structure in stone was erected from designs by Sir Christopher Wren. It was begun in 1670 and finished in 1672. It consisted of a central arch, closed by gates on certain occasions, through which passed the vehicular traffic, while a smaller arch bridged each pavement. In the centre of the upper storey was a room which was leased by Childs, the bankers, as a store for their old books. This room was flanked on the east, or Fleet Street side, by niches containing full-length statues of James I. and Elizabeth, and, on the west, or Strand side, by statues of Charles I. and Charles II. When the sovereign paid a ceremonial visit to the City, the gates were closed and the king-at-arms demanded admittance. After questions asked and answered the portals were thrown open and the Lord Mayor welcomed his monarch. This quaint custom gradually passed into desuetude during Queen Victoria's reign. The Bar was once known as the City Golgotha from the practice of exposing the heads (or other part) of traitors on spikes erected on its summit. The first victim was Sir Thomas Armstrong, who was involved in the Rye House Plot and one of whose quarters was set up on the Bar in 1684, and the last apparently were certain Jacobites who were hanged at Kennington Common in 1746. Their heads were exposed at once and two of them remained in position till 1772 when March storms threw first one ghastly relic down and then the other. In the growing commerce of the Victorian era the old Bar had become an obstruction and was demolished in 1878-9, being afterwards re-erected in 1888 as an entrance to Theobalds Park, near Cheshunt, in Hertfordshire. The City Fathers, however, unwisely raised (1880) another obstruction, called the Griffin, which was supposed to commemorate the site of the Bar and which, of course, was destitute of historical association. Theobalds, the new home of Temple Bar, was built by Lord Burghley, who here received Queen Elizabeth in 1564. It afterwards became the property of James I., who exchanged it for the nobler mansion of Hatfield and who died within its walls on March 27th, 1625. From Theobalds Charles I. set out in 1612 to raise his standard at Nottingham. The property at the time when Temple Bar was removed to it belonged to Sir Henry Bruce Meux.

Tenant (Latin, *tenens* from *tenere*, "to hold"). This word contains a much more extensive idea in the language of the law than it does in its popular sense, where it is used in contradistinction to the term "landlord," and always seems to imply that the land or property is not the tenant's own, but belongs to some other person of whom he immediately holds it; but in the language of the law every possessor of landed property is called a tenant with reference to such property, and this whether such landed property is absolutely his own, or whether he merely holds it under a lease for a certain term of years. The reason of this is that all the real property of the United Kingdom

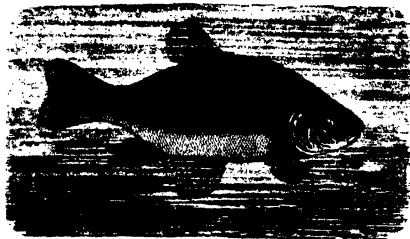
is by the policy of the laws supposed to be granted by, dependent upon, and holden of some superior lord in consideration of service to be rendered to the lord by the tenant or possessor of this property. Tenants are distinguished according to the nature of the estate they hold by appropriate and corresponding terms. Thus a person who holds an estate in fee simple is called a tenant in fee simple; if the estate be an estate tail, he is called a tenant in tail; if for years, a tenant for years; and so on. The word "tenant," therefore, when applied to a person always presupposes such person to be the holder or possessor of an estate of some kind, but of what estate cannot be determined without the additional adjuncts referred to.

Tenasserim, a division of Lower Burma, bounded on the N. by Pegu, on the E. by Siam, on the S. by the Isthmus of Kra and on the W. by the Bay of Bengal. It comprises the districts of Toungoo, Salwin, Thaton, Amherst, Tavoy and Mergui and occupies 36,000 square miles. The surface is mountainous and covered with dense forests, but there are fertile tracts well adapted for the cultivation of grain. In the north it is watered by the lower reaches of the Salwin. Moulmein is the capital and other considerable towns are Amherst, Tavoy, Mergui and Tenasserim. The district became a British possession at the close of the first Burmese War (1825). Pop. (1901), 1,137,776.

Tenby, a watering-place of Pembrokeshire, Wales, $9\frac{1}{2}$ miles E. of Pembroke. It is delightfully situated on the summit and slopes of a rocky peninsula on the western shore of Carmarthen bay, the fine stretch of sands on the north and south sides of the town affording excellent bathing which, along with the equable climate and mild winter season, has brought the place into considerable vogue as a health and holiday resort. The chief buildings are St. Mary's Church (partly rebuilt in 1885), which is mostly Early English and Perpendicular; the town hall, Assembly Rooms, hospital and natural history museum. On the promontory stand the ruins of the castle, comprising the keep, portions of the ramparts and the principal gateway; Henry VII., when Earl of Richmond, found shelter within its walls, pending his escape to France (1471). The Castle Hill, laid out as a promenade, is crowned with a marble statue of Prince Albert erected in 1865. St. Catherine's Rock, at the extremity of the peninsula, is fortified. The ancient walls of the town remain to a large extent and are flanked by several square and circular towers. There is a meteorological station and Tenby also offers in its wealth of shells and marine fauna great attractions to the student. A fishing village occupied the site in the days of the Britons and in the reign of Henry I. a colony of Flemish weavers was planted here. It was incorporated by William Valence, Earl of Pembroke, in the 13th century and by Royal charter in 1402. Pop. (1901), 4,400.

Tench, a fish belonging to the genus *Tinca* of the Carp family, with a single species, *T. vulgaris*, frequenting stagnant waters, but more common on the Continent than in England. Tench of three

feet long are on record, but less than half that size is far above the average. The usual colour is brown with a yellow tinge. It has a thick skin covered with mucus and is extremely tenacious



TENCH.

of life. In certain parts of England it is believed to heal its wounded companions, by pouring its mucous secretion over their injuries; hence arose its popular name of "Dr. Tench." The so-called Golden Tench are fish with a tendency to albinism.

Tender. When a person is ready and willing to pay his creditor he may make what is called in law a tender of the amount. There are certain legal restrictions in so doing, for the money must be actually produced, unless the creditor dispenses with this at the time. The tender must also be unconditional and for this purpose, in case a receipt is wanted, the debtor should bring a stamped receipt with him and require the creditor to sign it and to pay the amount of the stamp. Having done this, he is in a position to make a "plea of tender" to any action brought by the creditor. This plea, however, must be accompanied by an actual payment of the amount into court, such payment being alleged in the plea and acknowledged in the margin thereof. The plea amounts in law to an admission of the cause of action. As regards the legal tender of money, Bank of England notes are legal in England and Wales for every purpose, but cannot be tendered by the Bank of England, nor can anyone be compelled to give change. Gold is legal tender to any amount, silver up to forty shillings, and bronze (including halfpence and farthings) up to but not over twelve pence.

Tendon, the name given to a structure which serves to connect muscles with bones. Tendons are composed of connective tissue; the largest tendon in the body is the tendon in which the muscles of the calf of the leg terminate. [ACHILLES TENDON.] Tendons are sometimes ruptured and inflammation occasionally occurs within the sheath of a tendon. [WHITLOW.]

Tendrils, a climbing organ produced by the modification of various parts in different flowering-plants. In the vine and Virginian creeper (*Ampelopsis*) the flowers occasionally borne on the tendrils show them to be modified branches. The structural origin of the unbranched tendrils of the cucumbers and passion-flowers is not free from

doubt; but those of the vetchling *Lathyrus Aphaca* as clearly represent the whole leaf (except its stipules) as those of the sweet-pea (*L. odoratus*) represent the terminal and some of the lateral leaflets. Charles Darwin suggested that the twisting petioles of *Clematis* and of *Tropaeolum peregrinum* (the "canary-creeper") represent leaves on the way towards becoming petioles. In *Smilax* the stipules are represented by a pair of tendrils, and in the lilaceous *Gloriosa superba* the apex of the leaf forms a tendril. Tendrils perform circumnutatory movements and are specially sensitive to contact on the inner surface of their hooked extremities. On penetrating a crevice, or on being pressed against a supporting surface, the end becomes enlarged, so as to become firmly fixed. Circumnutation then causes spiral coiling from either end in opposite directions, with a kink in the middle, thus drawing the climber nearer to its support, whilst at the same time permitting some free play in the wind.

Tenebrionidæ, a family of Beetles including the species *Tenebrio molitor*, the larva of which is well known as the "meal-worm." This is the common grub found in flour and grain: it is long and narrow, of a light yellowish-red colour and has a hard integument or skin. Another species is *Blaps mortisaga*, the so-called "Churchyard beetle."

Teneriffe, the largest of the Canary islands, between Gran Canaria on the E. and Gomera on the W. It is 60 miles in length and covers an area of 785 square miles. It is of volcanic origin and culminates in the Peak, which has been dormant since the latter part of the 18th century. It rises to a height of 12,200 feet from a plain—itsself 7,000 feet high—of lava and pumice, 8 miles in extent, and surrounded by precipitous rocks. The Peak is covered with forest and meadow in the lower part, but the upper is rugged and barren. There are in reality three peaks, and at the top is a crater 300 feet across, and 70 feet deep. At a height of 11,000 feet is an ice cave. The mount, which has a white appearance, is visible at a distance of 100 miles. The island yields maize, wheat, potatoes, pulse, almonds, bananas, lemons, oranges, honey, wax, cochineal and sugar. Among the forest trees are the dragon-tree (of which there is a celebrated specimen at Orotava), coconut, date, euphorbia and various cacti. The manufactures include textiles, cabinet-work and other furniture, and wine. The Guanches, the original inhabitants, were almost exterminated in their efforts to resist the Spaniards, to whom Teneriffe, along with the other Canary islands, belongs. Santa Cruz de Teneriffe, on the north-eastern coast, is the capital. Pop. (1900), 138,008.

Tenesmus. Under certain conditions, continually repeated and painful efforts to evacuate material from the bowel are made with very little result, the patient being caused to go to stool not so much by reason of the presence of faecal matter in the lower bowel as by the existence of an irritated state of the mucous membrane of the large

intestine. This condition, called tenesmus, is a characteristic symptom of dysentery. It may also be associated with piles, fistula and other diseases of the rectum. The treatment is almost wholly local. Applications of heat or cold, or wet pads, or small enemata of laudanum, or suppositories of morphine, cocaine, or belladonna are among the most usual remedies.

Teniers, DAVID, the Elder, painter, was born at Antwerp in 1582 and studied under Rubens and Adam Elsheimer at Rome. His pictures, for the most part, represent village festivals, groups in taverns, and similar scenes. He died at Antwerp in 1649. He showed considerable skill in composition and had a good sense of humour, but he has been completely overshadowed by his son,



"THE MUSIC PARTY."

(By David Teniers, the Younger, in the National Gallery, London.)

DAVID TENIERS, the Younger, who was born at Antwerp on December 15th, 1610. He studied under his father and possibly also under Adrian Brouwer and Rubens. He was appointed President of the Guild of St. Luke at Antwerp in 1644. In 1647 he settled in Brussels, where he became Director of the Picture Gallery. In 1663 he was instrumental in founding the Academy of the Fine Arts in Antwerp. He died at Brussels on April 25th, 1690, and was buried at Perck, near which stood his château of Dry Toren, introduced into several of his pictures. He knew and one might almost say loved every phase of rural life, for he has reproduced the manners and customs of his country folk with inimitable fidelity. He was a flexible draughtsman, was a master of composition and had a fine eye for colour. He is well represented in the National Gallery in London, Dulwich Gallery, Glasgow, Madrid, the Louvre and the Hermitage Gallery in St. Petersburg, in addition to many private collections.

Tenison, THOMAS, Archbishop of Canterbury, was born at Cottenham, Cambridgeshire, on September 29th, 1636, and educated at Norwich and Corpus Christi College, Cambridge. He was ordained in 1659 and, after holding several cures in the eastern counties, was presented to the rectory of St. Martin's-in-the-Fields, London, in 1680. He discharged the

duties of his large parish with great zeal, building for it in 1695 in Castle Street, Leicester Square, the first public library in the metropolis. He also endowed a school, which was held under the same roof as the library. (In 1870 the school was removed to a building in Leicester Square, erected on the site of the house once occupied by William Hogarth, the library having been sold in 1861 for the benefit of the school.) In 1691 he was appointed Bishop of Lincoln and in 1695 succeeded John Tillotson as Archbishop of Canterbury. He ministered to Queen Mary and William III. on their deathbeds, and crowned both Queen Anne and George I. He died at Lambeth on December 14th, 1715. He was a firm opponent of the Jacobites and on this account was probably depreciated as a dull man. But he was a hard-working, faithful prelate, whose good works were performed without ostentation.

Tennant, WILLIAM, poet and linguist, was born at Anstruther Easter, Fifeshire, on May 15th, 1784, and educated at the burgh school and St. Andrews University. He studied of his own accord Hebrew, Arabic, Syriac and Persian and, after acting as schoolmaster at Dunino, Lasswade and Dollar Academy, was appointed in 1834 Professor of Hebrew and Oriental languages in St. Mary's College, St. Andrews. He retired in 1848 and died on October 14th of the same year. He is chiefly remembered by his poem of *Anster Fair*, a humorous description of rustic merrymaking, which was published anonymously in 1812, and won almost instantaneous fame.

Tennent, SIR JAMES EMERSON, politician and author, the son of William Emerson, a merchant of Belfast, was born in that town on April 7th, 1804, and educated at Trinity College, Dublin. During a tour on the Continent in 1824 he visited Greece, and became a fervent adherent of the cause of Greek independence. He was called to the bar in 1831, but does not appear to have practised. On his marriage in the same year to the only daughter of William Tennent, banker of Belfast, he assumed this name. He was elected M.P. for Belfast in 1832 and continued to represent the town, with scarcely a break, till 1845. From 1841 to 1843 he was Secretary to the India Board. In 1842 the merchants of Manchester presented him with plate valued at £3,000, in acknowledgment of his services in promoting the Copyright of Designs Bill. From 1845, when he was knighted, to 1850 he was Civil Secretary to the Government of Ceylon and, in the latter year, was gazetted Governor of St. Helena, but did not take up the appointment. On his return home he sat for a few months as member for Lisburn, was Permanent Secretary to the Poor Law Board for a short time in 1852 and then became Secretary to the Board of Trade, a post he held till his retirement in 1867, when he was created a baronet. He was elected F.R.S. in 1862, and died in London on March 6th, 1869. His chief work, *Ceylon: an Account of the Island, Physical, Historical and Topographical* (1859), became popular and ultimately attained to standard rank.

Tennessee, a south central state of the United States, bounded on the N. by Kentucky and Virginia, on the E. by North Carolina, on the S. by Georgia, Alabama and Mississippi, and on the W. by Arkansas and Missouri, the river Mississippi here forming a natural boundary. It occupies an area of 41,750 square miles and is divided physically into East, Middle and West Tennessee. The Eastern district extends from the Smoky Mountains to the Cumberland plateau, and contains ridges of the Alleghanies, with fine scenery. Between the eastern ridge and the table-land (100 miles) is a valley region extending from north to south. At the southern end of the plateau is a valley, through which the Sequatchie flows to join the river Tennessee. The Middle portion, between the North Tennessee river and the Cumberland Mountains, presents a diversified surface. The Western part between the rivers Tennessee and Mississippi, has a ridge, stretching north and west and sloping down towards the Mississippi Valley. Among the mineral productions are coal, second only to that of Pennsylvania in quality and quantity, iron-ore, zinc, copper, asbestos, kaolin, slate, lithographic stone, petroleum, gypsum, alum, borax and marble. The climate generally is good, and the soil fertile, maize, wheat, oats, barley, rye, potatoes, hay, cotton, tobacco, hemp, sweet potatoes, apples and other fruits and vegetables being the chief crops. Horses, cattle, sheep, swine and mules are raised in large numbers. The leading industries are flour- and grist-milling, lumbering, timber products, textiles, iron and other metal working, tanning, distilling, carriage-building, furniture-making and the making of tobacco and cigars. The Cumberland and Tennessee rivers communicate with the Ohio, and there are more than 3,000 miles of railway. The state has 96 counties, sends 10 members to Congress, and has for principal cities Nashville (80,365), the capital, Memphis (102,320), the great cotton mart, Knoxville (32,637) and Chattanooga (30,154). In 1796 the state was admitted into the Union and in 1861 it joined the Confederates. It gave three Presidents—Jackson, Polk and Johnson—to the Union. Pop. (1900), 2,020,616.

Tenniel, SIR JOHN, artist, was born in London in 1820 and studied for some time at the Royal Academy Schools, but was mainly self-educated. He first exhibited at the Society of British Artists in 1836 and gained a premium of £200 in the competition for the decoration of the Houses of Parliament. He began to contribute to *Punch* in 1851 and, after the death of John Leech in 1864, was unrivalled as a designer of political cartoons. In 1893 he received the honour of knighthood and

retired from the *Punch* staff in 1901. His cartoons were always admirably drawn and of excellent taste and frequently rose into designs of classical worth, on which occasions it is not too much to say they gained the attention and applause of the whole world. In addition to his drawings for *Punch*, Sir John occasionally illustrated books, his pictures for Lewis Carroll's *Alice's Adventures in Wonderland* (1866) being probably his most familiar as it was also his most popular work in this style. His unremitting labours left him little



AJAX DEFEYING THE LIGHTNING—CARTOON BY TENNIEL.
(Reproduced by special permission of the Proprietors of "Punch.")

leisure for painting, but he was sometimes represented at exhibitions in London.

Tennis, probably the most ancient of surviving ball-games, is supposed to have been invented in Italy during the Middle Ages, and, after various improvements in France, to have been introduced from the latter country into England, where it had become popular in the days of Chaucer. The rules are very elaborate, the essential feature being that a ball is struck with a racket against one of the walls of a court, so as to rebound on the other side of a net, whence it is returned by the original player's ("server's") opponent, or one of his

opponents, if there are more than two players. The ball is thus driven backwards and forwards repeatedly. The scoring is regulated by success or failure in so returning the ball that it falls into a "winning hazard" or does *not* fall into the net or "out of court." There are also intricate rules as to "chases," which arise when a ball is allowed to touch the ground a second time. LAWN TENNIS, an adaptation of the original game which has come into general vogue in nearly every quarter of the globe, is said to have been invented by Major Wingfield in 1873. It is played on grass or asphalt courts either single-handed or in pairs (that is, two a side) and since it can be participated in by women (mixed doubles being a favourite variety) it has attained to a popularity which far exceeds, in this regard, all other outdoor sports. The use of asphalt courts enables the game to be pursued in winter, which gives it a further claim on the affection of its devotees. All forms of the pastime (single-handed, three-handed and four-handed) are governed by rules drawn up by the All England Tennis Club and latterly by the Lawn Tennis Association which was founded in 1888. These rules contain a full exposition of the laying out of a court, the mode of service and other points in the play.

Tennyson, ALFRED, LORD, poet, was born on the 6th of August, 1809, at Somersby, in Lincolnshire. His family, through the D'Eyncourts,



LORD TENNYSON.

(Photo: H. H. Cameron, Mortimer Street, W.)

claimed descent from the Plantagenets and, to the aristocratic feeling thus imparted to the boy, clerical influence was added by both his parents. His father was rector of Somersby and vicar of Grimsby; his mother, Elizabeth Fytche, daughter of the vicar of Louth. He was the third son, and both his elder brothers, Frederick (1807-98) and

Charles (1808-79), became poets. Charles was his companion at the grammar school of Louth, which the two boys quitted in 1820. Their education was then conducted at home and the freedom which they enjoyed bore fruit in an early devotion to poetry. In 1827 they sold *Poems by Two Brothers* for £10 and £10 worth of books to a firm of printers in Louth, and in 1828 they proceeded to Trinity College, Cambridge, where Frederick had already gained a university prize for Greek verse. Alfred, in 1829, won the Chancellor's Medal for a prize poem, "Timbuctoo," the first of such compositions in blank verse, but sought no further distinctions and left the university in 1831 without a degree. Among the friends he made at Cambridge were Monckton Milnes, Maurice and Arthur Hallam, who met in a society called "The Apostles" and, by their fearless discussions, laid down the foundations of a broad faith at the time when the best intellects of Oxford were narrowing themselves into the Tractarian theology. In 1830 Tennyson went with Hallam to the Pyrenees, to carry money and letters to the leaders of a revolt, and published *Poems Chiefly Lyrical*, containing "Isabel," "Mariana," etc. In 1833 appeared *Poems*, including "The Lady of Shalott," "The Miller's Daughter" and "A Dream of Fair Women." *The Lover's Tale*, published in the same year, was suppressed, to be republished with its conclusion, *The Golden Supper*, in 1879. In the autumn of 1833 Hallam died, and for the next nine years little is heard of Tennyson, who seems to have lived mainly with his mother, now a widow, and his sisters. In 1842 he brought out a revised edition of his earlier volumes, with some new poems, "Lady Clara Vere de Vere," "Morte d'Arthur," "The Gardener's Daughter," "Locksley Hall," etc. In 1845 he received a Civil List pension of £200 a year, which was the cause of an attack by Bulwer Lytton in "The New Timon," to which he replied in *Punch* in "The New Timon and the Poets," and "Afterthought." He published *The Princess* in 1847 and, in 1850, *In Memoriam*. On June 13th, 1850, he married Emily Sellwood, daughter of a solicitor at Horncastle, niece of the Arctic explorer, Sir John Franklin, and sister to the wife of his brother Charles. In the same year he was created Poet Laureate in succession to William Wordsworth. In 1852 he wrote the "Ode on the Death of the Duke of Wellington," and in the next year settled in the Isle of Wight, at Farringford, near Freshwater. In 1854 he published "The Charge of the Light Brigade," and in 1855 *Maud*. He helped the Volunteer movement of 1859 with his poem, "Riflemen, form!" and in the same year made a fresh reputation with the first four *Idylls of the King*, "Enid," "Vivien," "Elaine" and "Guinevere." *Enoch Arden* and "The Northern Farmer (Old Style)" came out in 1864, "The Victim," "Lucretius" and "The Northern Farmer (New Style)" in 1868. At this time the poet was building himself a house, Aldworth, near Haslemere, in Surrey, where he afterwards spent the summer months, returning to the Isle of Wight for the winter. In 1869 he published *The Holy Grail*, which also included *The Coming of Arthur*,

Pelleas and Etarre and *The Passing of Arthur* : in 1871, "The Last Tournament" and, in 1872, *Gareth and Lynette*. He next turned his attention to the development of the dramatic power of which he had always shown traces and produced a succession of plays, some of which were produced by Sir Henry Irving with widespread acceptance—*Queen Mary* (1875), *Harold* (1876), *Becket* (1878), *The Falcon* (1879), *The Cup* (1881), *The Promise of May* (1882) and *The Foresters* (1892). Meanwhile, he did not cease to publish poetry. In 1880 he brought out *Ballads and other Poems*, containing "Rizpah," "The Village Wife," "Sir John Oldecastle," etc. ; in 1885 *Tiresias* ; in 1886, *Locksley Hall, Sixty Years After* ; in 1889, *Demeter and other Poems*. After his death at Aldworth on October 6th, 1892, *The Death of Chino and other Poems* appeared. He was buried in Westminster Abbey on October 12th. Beyond this record of work accomplished, there is little to add as to the life of the poet, who abhorred the custom of making private details public property. He was twice offered a baronetcy and in 1884, on the recommendation of W. E. Gladstone, was created Baron Tennyson of Aldworth and Farringford. As a thinker, in politics he looked for social progress on conservative lines, and he strove, in philosophy, both before and after the publication of Charles Darwin's work, to interpret the struggle for existence in the light of a broad Christianity. The melody and stately simplicity of his language are unrivalled, and he stands alone as the poet who has been completely successful in various fields—in lyrics of love and war, in broad humour, in epic and dramatic creation. The standard biography by his son, the 2nd Lord Tennyson, appeared in 1897.

Tenor, the highest of male chest voices, extending between tenor C and treble A. There are various gradations of tenor, of which the most usual are the robust and the light. The term is applied also to certain instruments of similar compass to the tenor voice. The viola is sometimes described as the tenor violin.

Tenotomy, an operation which consists in dividing a tendon, with a view to remedying deformity by allowing the growth of new material between the severed ends. Tenotomy is sometimes practised in the deformity known as club-foot.

Tenrec (*Centetes caudatus*), the best-known species of the family Centetidae and the largest of the Insectivora, being from 12 to 16 inches long. It is a native of Madagascar, Bourbon and the Mauritius ; the body is squat, the snout produced. It feeds on earthworms and insects, but occasionally it will take fruits and roots. It is largely used as an article of diet, its flesh resembling that of the sucking-pig, though objected to by some because of its musky flavour. It habitually indulges in a long summer sleep, this æstivation being the analogue of the hibernation, or winter sleep, of colder regions. The Tenrec is also known as the Madagascar Hedgehog.

Tension is a force which acts equally towards both ends of a stretched string supposed perfectly

flexible and inextensible. If a mass hang down by a string, and the whole be at rest, the tension in the string is just sufficient to balance the weight of the mass ; it is therefore equal to this weight. When we are dealing with bodies in motion and connected by a string, the value of the tension is not at once apparent. Suppose a mass A resting on a smooth table to be connected to a mass B by means of a string passing over a frictionless pulley. Motion will be set up, the string will remain tight, and the two bodies will be equally accelerated. To find the tension T in the string, we may consider the mass A to be acted on by T along the table ; the acceleration of A will therefore be $\frac{T}{A}$, where T is in units of force (poundals), and A in units of mass (pounds). But this same tension is also acting vertically upwards on B, which is further subjected to the downward action of its own weight. The difference between these two is the resultant force acting on B. Its acceleration will therefore be $\frac{B g - T}{B}$. Since both bodies move

equally, we have

$$\frac{T}{A} = \frac{B g - T}{B} \quad \text{or,} \quad B T = A B g - A T \therefore T(A + B) =$$

$$A B g \quad \text{and} \quad T = \frac{A B g}{A + B} \text{ poundals, or } \frac{A B}{A + B} \text{ pounds}$$

weight. Thus if A be 6 lbs. and B 2 lbs., the tension acting throughout the string is $1\frac{1}{2}$ lbs. weight or 48 poundals. When a shaft is driven by means of a belt passing over a pulley, the tension on the receding part of the belt is greater than that in the approaching part. The difference of the tensions in these two portions is one of the factors which determine the power transmitted. This difference cannot be made to exceed a certain limit, which is determined by the condition that the belt shall not slip. It is the fact of friction existing between the belt and the pulley that allows the tension in the one part to exceed that in the other.



TENREC.

Tentaculifera, a class of the unicellular animals known as Protozoa, characterised by the possession of cilia only in the young stage of life. They are usually fixed, are protected by a cuticle or

simple kind of shell, and have prehensile tentacles. They are carnivorous and live either in fresh or salt water. They are divided into two orders, the Suctorina and Actinaria; the former have suctorial tentacles with or without others, while the latter never have the suctorial appendages.

Tentaculites, an interesting genus of fossils occurring in the Ordovician, Silurian, and Devonian rocks, and the type of the family Tentaculitidae. The genus has been assigned to the Pteropoda and is regarded as the most typical of all the Palaeozoic fossils referred to that class. It seems, however, much more probable that it is a worm-tube, in consequence of the agreement of its microscopic structure with that of Cornulites. In England the best specimens come from the Wenlock Limestone of Dudley in Worcestershire.

Tenterden, a town of Kent, England, 18 miles S.S.E. of Maidstone and 10 miles from the sea at Rye harbour. It is pleasantly situated upon an eminence, in the vicinity of which are several hop gardens. It is said that the sea once came up as far as Smalhythe in the parish and the town was annexed formerly to the port of Rye and so enjoyed the liberties of a subordinate Cinque Port. It was an early seat of the woollen trade and at the Reformation was noted for its opposition to the old religion. The church of St. Mildred, with a handsome Perpendicular tower, is associated with the legend of the origin of the Goodwin Sands, off the east Kent coast, said to have once formed a lowlying island protected by a wall from the waves. At the Conquest the property was taken from Earl Godwin and given to the abbey of St. Augustine's in Canterbury, but the Abbot, having used the stones of the sea-wall to build the church, the tide in 1099 submerged the area for ever and so "Tenterden steeple caused Goodwin Sands." Pop. (1901), 3,243.

Tenterden, CHARLES ABBOTT, BARON, Lord Chief Justice, the son of a barber and wig-maker, was born at Canterbury, Kent, England, on October 7th, 1762, and educated at the Grammar School of his native city and Corpus Christi College, Oxford. After a successful career at the bar, he became, in 1816, a puisne judge of the Common Pleas, but during the same year was transferred to the King's Bench. He was made Lord Chief Justice in 1818, in succession to Lord Ellenborough, and raised to the peerage in 1827. He died in London on November 4th, 1832, and was buried in the Foundling Hospital, of which he was a governor. In 1802 he published his *Law relative to Merchant Ships and Seamen*.

Tenure signifies the holding of lands or tenements of some superior, which in feudal times was the leading characteristic of real property. The sovereign, who was at once the source of property and the fountain of justice and honour, had bestowed large territories on the great barons who immediately surrounded the throne, and these

again had distributed his bounty through the channels of their numerous dependents. In legal contemplation at least all the landowners of England thus derived their estates. On this foundation the system known as the feudal system was based—a system which linked every feudatory by a chain more or less extended to the Crown, and rendered his fief ultimately liable to resumption by the sovereign power from which it had, or was assumed to have, originally emanated. The nature of the tenure was characterised by appropriate terms. [FEUDAL SYSTEM.]

Tepyaaks, or TEPETERIAKS, a Finno-Tatar people of East Russia, chiefly in the government



"THE GUITAR LESSON."

(From the painting by Gerard Terburg in the National Gallery, London.)

of Ufa, but also in Orenburg and Perm, numbering some 126,000. They appear to be originally Volga Finns and still speak a Finnish dialect, but the type has been greatly modified by crossings with the surrounding Bashkir and Túrki populations. They are, as was inevitable, being gradually Russified.

Terbium, a rare metallic element which occurs associated with other rare metals—e.g., niobium, erbium, etc., in a few minerals—e.g., samarscite. It forms salts corresponding to the oxide Tr_2O_3 , but, owing to its rarity, the chemistry of the metal and its compounds is very incompletely known.

Terburg, GERARD, painter, was born at Zwolle, in the province of Overijssel, Holland, in 1608. He studied art in Rome and Paris and visited England,

before he settled in his native land. He happened to be at Münster in 1648, whilst the Congress sat to arrange the terms of peace between Spain and the Netherlands, and of this gathering he painted a picture, "The Peace of Münster," now in the National Gallery in London, which is esteemed his *chef d'œuvre*. Whilst in Madrid, some time afterwards, he was knighted by Philip IV. He became burgomaster of Deventer, where he died on December 8th, 1681. His pictures exhibit contemporary Dutch life in its more refined aspects. His portraits were excellent, while in the rendering of the texture of draperies he has never been surpassed.

Tercine, the conical papilla upon the placenta of spermatophytic plants which forms the earliest stage of the ovule—also called the nucellus, or, more objectionably, the nucleus. Its base becomes elongated into the funicle, and in most cases it is enclosed in succession by the secundine and primine which grow up round it like cups springing from its base (chalaza). From one of its hypodermal cells the embryo-sac (megaspore) originates; and in the ripe seed some of its tissues may survive unabsorbed, as the nutritive perisperm.

Terebinth (*Pistacia Terebinthus*), also known as the Cyprus Turpentine-tree, is a small resinous tree belonging to the order Anacardiaceæ and closely allied to the Mastic and the Pistachio. It is a native of the Mediterranean area and has deciduous, imparipinnate leaves and small round purple fruits. The turpentine is collected from incisions in its trunk, and the curious galls, produced in large numbers on the tree by the punctures of insects, are used in tanning Morocco leather as well as in dyeing.

Terebratula, one of the best-known genera of Lamp-shells or Brachiopoda, the type of the family Terebratulidæ. The animal has a bivalve shell, with one valve much larger than the other, and provided with a beak perforated by a pore through which passes the peduncle that fixes the animal to some support. The shell is smooth, except that it may have one or more broad folds on the margin, and is never marked by ribs as in the Terebratella. The support for the gills is short; those forms in which it is long are now separated as the genus *Magellania* (better known as *Waldheimia*), many of the species of which cannot be distinguished from *Terebratula* by external characters. As now limited, the genus ranges from the Devonian to the present time; it is most abundant in the Jurassic and Cretaceous periods.

Teredo, a destructive mollusc known as the Ship-worm. Its popular name is derived from the fact that the animal has a long cylindrical worm-like body and lives in burrows in wood submerged in the sea. It has, however, no connection with the worms, but is a Lamellibranch, belonging to the group *AdeSMACIA*, which also includes the *Pholas*, or *Piddock*. The animal has a pair of long siphons enclosed by the mantle which is in the form of a tube. The shell is small and globular and is situated

at the bottom of the burrow; this is lined by calcareous material. The burrows ramify through the wood, the strength of which is thus ruined. Wood



TEREDO.

used for piles can be protected against the attacks of the ship-worm by a coating of broad-headed nails, while ships are saved by their copper sheathing. The *Teredo* is widely distributed in existing seas, and it is known, from the evidence of bored wood, from the Liassic period onwards.

Terence, **PUBLIUS TERENTIUS AFER**, the great Roman comic poet, of the facts of whose life hardly anything is known, is supposed to have been born at Carthage about 185 B.C. and carried to Rome by M. Terentius Lucanus, who gave him a good education and eventually set him at liberty. He is believed to have died in Greece, or on his way to or from that country, about 159. His best works—*Andria* (166), *Heauton Timoroumenos* (163), *Eunuchus* and *Adelphi* (160)—are adaptations of plays by the Greek dramatist Menander, whilst the plot of *Phormio* is taken from Apollodorus. They depict Greek manners and set up a model of Greek refinement for the imitation of the Roman world. The Latinity of Terence is remarkably pure, and in pathos, wit, dramatic skill, and grasp of character he surpasses Plautus. His graceful manners and literary acquirements gained him the friendship of Lælius and the younger Scipio.

Teresa, or **THERESA**, **ST.**, mystic, was born at Avila in Old Castile, in Spain, on March 28th, 1515, and in her nineteenth year entered a Carmelite convent in her native town. From earliest childhood her religious susceptibility had been remarkable, but she was nearly forty when a vision, in which she beheld blood streaming from the figure on a crucifix, wrought an abiding change in her heart. Her mode of life now became severely ascetic and from this time she frequently fell into trances, in which she was granted many supernatural tokens of the divine favour. Alarmed at the laxity of discipline in her own and other Carmelite houses, she obtained the Pope's permission to found the order of Descalzos, or Barefooted Carmelites, which was established secretly at Avila in 1562. She died at Avila on September 29th, 1582. She was canonised in 1622 by Gregory XV. She was the authoress of an interesting autobiography and several mystical treatises.

Term, commonly used in three senses: (1) As signifying those four periods of the year during which the Superior Courts sit in London to hear and determine points of law and transact other legal business of importance—Hilary (beginning January 11), Easter (beginning in April, but depending on the Easter dates), Trinity (usually beginning about the end of May or in the first half of June) and

Michaelmas (beginning October 24) terms. These are now, however, better known as the "sittings" of the courts. (2) Signifying the limitation or extent of time for which a man holds an estate, which is called his term, and he himself is called, with reference to the term he so holds, the tenant of the term. (3) The word is used also in the sense of quarter-day, when rent is payable. The English quarter-days are Lady Day (March 25), Midsummer (June 24), Michaelmas (September 29) and Christmas (December 25). The Scottish terms are Candlemas (February 2), Whitsun (May 15), Lammas (August 1) and Martinmas (November 11). The removal terms in Scottish burghs are May 28 and November 28.

Termites. [WHITE ANTS.]

Tern, a bird belonging to the sub-family Sturninae of the Gulls. They are distinguished by their small size, long pointed wings, and long and usually forked tail. There are many species universally distributed. From their swift circling flight and their forked tails they are often called Sea-swallows. They feed on small fish and other marine animals, taking their food on the wing. The Common Tern (*Sterna fuscicollis*) is British.

Terpenes. A number of compounds are included in the Terpene group, all of which are intimately related chemically, and resemble one another very closely. They are chiefly obtained from the exudations from trees of the order Coniferae, from the resins, etc., of which they are derived by distillation. The distillate known as oil of turpentine contains a number of the terpenes, all of which possess the composition represented by $C_{10}H_{16}$. It is a mobile liquid, colourless or slightly yellow, which is insoluble in water, and possesses a specific gravity of about .85 to .89. That derived from pine consists chiefly of pinene and boils at about 158°. Other terpenes distinguished as limonene, citrene, etc., occur in the turpentine of other trees, the most noticeable physical difference between the various products being their action on polarised light. They all have agreeable odours and are good solvents for resins, sulphur, caoutchouc, etc. They are on this account largely employed for the manufacture of varnishes, oil-colours, etc. Their constitution has not yet been completely determined, but most appear to be derived from the compound cymene, a paramethyl-propyl benzene.

Terraces. [RAISED BEACHES.]

Terra-cotta (Italian "baked earth") properly denotes any object made of baked clay, but in the United Kingdom the term does not include pottery, but is used only of statuettes, busts, and similar objects, and of the more ornamental clay-work in architecture. Its colour is commonly buff, but sometimes yellow or red. Some of the finest works of classical art and many beautiful products of the Middle Ages and the Renaissance were wrought in terra-cotta. It is now much used in the façades of public buildings.

Terrapin, a general term for the tortoises of the family Chelydidae, occurring on the Atlantic

seaboard of the United States and esteemed for the table by epicures. They are found in fresh and brackish water, and feed on fish, reptiles and amphibians. The most highly valued is the Diamond-back Terrapin (*Marrocmemys palustris*) found in the salt-marshes along the eastern coast. In trade usage the fully-grown sexes are distinguished as bulls and cows and the younger ones as young bulls and heifers. [TORTOISES.]

Terrestrial Magnetism. [MAGNETISM.]

Terrier, properly a ground-dog, i.e., one that follows game into its burrows or earths. The term, however, is now used in a wide sense and applied to small dogs hunting above ground and to some kept as companions. Besides the breeds referred to in separate articles, there are the Black-and-tan, and White English terriers, the first-named by far the older, though now the less popular, of the two. The Scots terrier has a hard, stiff coat and is stoutly built, with short limbs and tail. The Dandie Dinmonts probably have an infusion of Bull-dog blood: dark dogs are called "Peppers," and light ones "Mustards," from their prototypes in Sir Walter Scott's *Guy Mannering*. The Irish terrier, larger than the Fox-terrier, with a hard, reddish coat, does not go to ground. [BEDLINGTON, BULL-TERRIERS, FOX-TERRIER, SKYE.]

Terry, ELLEN ALICIA, actress, was born at Coventry, England, on February 27th, 1848, and made her first appearance, as the child "Mamilius" in *The Winter's Tale*, at the Princess's Theatre in London in 1856. After playing with ever-increasing acceptance in various stock companies, she joined, in 1878, Sir Henry Irving's company at the Lyceum Theatre, London, and was associated there and on tour for many years with a brilliant series of representations, which effectually established her supremacy in winsome comedy and tragedy — on its pathetic rather than heroic side. Her Shakespearean parts include "Ophelia," "Portia," "Cordelia," "Desdemona," "Juliet," "Beatrice," "Lady Macbeth," "Imogen," "Mrs. Page," and "Katharine of Aragon." She married, while quite young, G. F. Watts, R.A., the distinguished painter, and, this union being dissolved, she married at a later date Mr. E. A. Wardell, who acted under the name of "Charles Kelly," and on March 22nd, 1907, whilst on tour in the United States, she was wedded at Pittsburg to Mr. James Carew, the actor.



ELLEN TERRY.

Tertian Fever. [AGUE.]

Tertiary Rocks, that geological formation lying above the Mesozoic or Secondary and below the Quaternary. The term is equivalent to the Cainozoic of some authors, while other geologists

make the division include both Tertiary and Quaternary, since the latter formation is of too brief duration (according to them) for separation. The word Tertiary belongs to the era when classification was at its simplest and the strata composing the earth's crust were broadly divided into three groups—the Primary (oldest), Secondary (Middle) and Tertiary (most recent). Sir Charles Lyell, again, broke up the Tertiary into three sections, according to the percentage of living Mollusca in each. These were the Eocene, Miocene and Pliocene, while to increase the convenience of this system of nomenclature, Heinrich Ernst Beyrich intercalated a fourth section, the Oligocene, between the Eocene and Miocene. The outstanding features of the Tertiary Age were the growing importance of the land surface, the increasing development of terrestrial fauna and flora, the upheaval of mountains, the disappearance of the gigantic "antediluvian" reptiles, the diminution of tree-ferns and other types of vegetable life, the reduced temperature, and the appearance of man, probably before the close of the Pliocene.

Tertullianus, QUINTUS SEPTIMIUS FLORENS, the earliest of the Christian fathers, was born at Carthage, probably about 150. He was the son of a Roman centurion, and received a good education in Greek and Latin, studying both at Carthage and Rome. The statement of Eusebius that he became an eminent jurist at Rome is borne out by the forensic style of his works, marked as they are by all the traits, good and bad, which might be expected in a skillful pleader. His conversion to Christianity probably took place between 190 and 195. He became a presbyter at Carthage, but was afterwards led by his ascetic views into the Montanist heresy. In judging of his style, which is often harsh and obscure, it must be remembered that he had before him the hard task of inventing a vocabulary and phraseology in which to express Christian ideas. In spite of these difficulties he is a vigorous, terse, graphic and often eloquent writer. Among his chief works are the *Liber Apologeticus*, the book *De Præscriptione Hæreticorum*, five books *Adversus Marcionem*, and treatises *De Baptismo*, *Ad Martyres* and *De Corona Militis*. Few details of his career are known, but he died probably about 230.

Test Act, THE (1673), required all persons in England holding any office under the Crown, whether military or civil, to take the oath of allegiance and supremacy, receive the sacrament according to the rites of the Church of England, and subscribe the declaration against transubstantiation. It was directed against the Roman Catholics, but was equally effective against Dissenters. A similar Act was passed for Scotland in 1681. These Acts were virtually nullified by an Act of Indemnity which was passed annually. They were repealed on the motion of Lord John Russell in 1828, though the Act giving effect to the relief was not passed till the following year.

Testacellidæ, a family of slugs belonging to the order Stylommatophora and the class

Gastropoda. The members of the family have a spiral shell of very small size, situated at the hinder end of the body. The shell is thus rudimentary, as it is useless for protection.

Tetanus, or LOCK-JAW, a disease in which painful involuntary tonic contractions of the muscles of the body occur. Tetanus is generally traceable to injury with breach of surface of the skin, it is an occasional result of compound fracture, and in rare instances originates from a comparatively simple lesion (traumatic tetanus). In some cases no history of a scratch or bruise can be traced (idiopathic tetanus). Of late years it has been shown that the cause of the malady is the introduction or growth within the nervous structures of the body of a micro-organism, the bacillus tetani. The first symptoms in the case of traumatic tetanus usually occur after the lapse of 5 or 6 days from the time of injury; they may, however, appear much earlier, and in some instances are delayed till the end of three or four weeks. At the outset the muscles of the jaws or neck are commonly involved, stiff neck or difficulty in masticating or swallowing being complained of. As time goes on the spasm becomes more pronounced, and extends to other voluntary muscles, and often to the diaphragm, producing difficulty in breathing. Sometimes the spasm is almost confined to the muscles of the jaw, whence the term lock-jaw; usually, however, the spasm is widely distributed. The body may be arched backwards by spasm of the muscles of the back, producing what is called opisthotonos; and in other cases the body is bent forwards or to one or other side (emprosthotonos or pleurosthotonos). The spasm is aggravated, or attacks of spasm may be brought on, by noises, slight muscular efforts and other trivial disturbances. Tongue-biting is a common symptom and the contraction, when it involves the muscles of the face, gives the patient a remarkable appearance, to which the term risus sardonicus has been applied. The pulse is rapid, sweats are common, the temperature is usually raised and attains in some instances before death a remarkable elevation. The treatment of tetanus consists in maintaining absolute quiet in a darkened room and administering chloroform or opium. In some instances division of a nerve above the seat of injury (if such exists) has been resorted to. An antitoxin obtained from the blood of animals affected with tetanus has been employed as an antidote to the disease in man; there appears some reason for hoping that this may prove efficacious in curing what has hitherto been regarded as an almost necessarily fatal disease.

Tetany, a disease of rare occurrence, which is generally met with in children or young adults and is characterised by painful spasm of certain muscles, usually of the hands and fore-arms, sometimes of the feet. The disease is commonly associated with rickets, sometimes with joint affections or laryngismus. The subjects of tetany generally recover from the malady when subjected to a course of tonic treatment. Improvement in sanitary conditions, plenty of ventilation without

draughts, and wholesome nutritious diet will promote the cure.

Tetrabranchiata, an order of Cephalopoda, including the Pearly Nautilus. The characters of the order are that the animal is protected by an external shell composed of many chambers, of which the last is occupied by the body of the animal. The chambers are separated from one another by thin plates or septa, each of which is perforated by a membranous tube known as the siphuncle. In the recent species there are four gills, whence the name of the order. It is probable that the fossil forms had the same number, which may be a relic of an ancestral condition when the organs of the body were repeated in a series, as in the worms. The region of the body around the mouth is divided into lobes, which correspond to the arms of the Dibranchiata, such as the cuttlefish. On the lobes are many tentacles, which correspond to the suckers on the arms of a cuttlefish. The funnel is a mere slit and not closed as a tube, and there is no ink-bag. The eye is much more primitive in structure than that of the cuttlefish. The Nautilus has a beak-like pair of jaws; similar structures occur in many fossil forms and were described as Rhyncholites and Rhynchoteuthis before their real character was known. The shell in the Nautilus is a discoidal coil, but in fossil forms great variations are known; thus, in some the coil is not in one plane, but in a spire, as in Turrilites, or it may be an open coil, as in Lytoceras; in others the shell is not coiled, but cylindrical, as in Orthoceras, in which it is straight, or Cyrtoceras, in which it is bent, or hook-shaped, as in Hamites. Most of the Tetrabranchiata are extinct. The order was of great importance in Palæozoic and Mesozoic times; in the Cainozoic period it is much rarer and the only living genus is the Pearly Nautilus. There are two sub-orders: the Nautiloidea, of which the Nautilus is the type and which includes most of the Palæozoic forms, such as the Orthoceratidae and such abnormal types as the Asceoceratidae; the second sub-order is the Ammonoidea, which includes most of the Mesozoic species, such as the Ammonites, and also some Palæozoic families, such as the Clymenidae and Goniatitidae.

Tetracidaris, a genus of Sea-urchins occurring in the Cretaceous rocks of France, which is of importance as having more than two rows of plates in each of the five interambulacral areas. [For terms see ECHINOIDEA.] This character is otherwise only known in the sea-urchins of the Palæozoic period, which are separated largely on this character as a distinct group.

Tetracoralla, a name originally applied to all corals in which the septa are arranged in 4 or multiples of 4, instead of in 6 or multiples of 6, as in most recent corals. This arrangement has now been abandoned and the term is used as a synonym of the group of corals known as Rugosa. These corals all have a tetrameral arrangement, but many others with the same character are assigned elsewhere. Thus, the recent Gypnia of the West

Indies and *Holocystis elegans* of the Lower Greensand are assigned to the Turbindidae and Astræidae respectively; while the Silurian family of the Stauridae are now included in the Aporosa. Quelch, indeed, proposed to divide all the Tetracoralla among this order; but this seems to be too radical and the corals appear worthy of retention in a separate group.

Tetractinellida, an order of Sponges, including those with a skeleton composed of spicules composed of four rays. The spicules may be free, or united by interlocking processes or some intermediate substance; in rare cases the skeleton is absent. The order is also known as the Spiculispongiæ. Most of the members of the group are extinct; but a few, such as *Tethya*, *Geodia* and *Halisarca*, are still living. It dates from the Silurian period onwards.

Tetramera, a section of the Coleoptera or Beetles, including those with four joints in the tarsus or last division of the leg. The great group of the Longicorns and the Weevils are the two best-known members.

Teutonic Knights, a military-religious order founded in 1198. The members were bound to tend the sick and wounded and fight the heathen. It was finally suppressed in Germany by Napoleon in 1809. It still exists in Austria.

Teutonic Languages, a main branch of the Aryan linguistic family, in which they hold a position somewhat intermediate between the Slavonic and the Italo-Celtic groups, while presenting some special phonetic and structural features which give them a unique place in the family. In this group the organic Aryan mutes undergo two distinct series of permutations, in accordance with the so-called law of Lautverschiebung ("Sound-shifting"), discovered by Rasmus Kristian Rask (1787-1832), developed by Jakob Grimm (1785-1863), and completed by Verner. The first series of shifts took place in prehistoric times, and is found already fully carried out in Gothic, the oldest known member of the group. In this process the surds or voiceless stops *p, k, t* first become everywhere the voiceless spirants *f, h, th*; then these spirants, when medial and in association with sonants, become themselves the sonant or voiced stops *b, g, d*, always in weak syllables and also in strong syllables before the accent; but when they follow the accent the second shift is arrested and they remain voiceless spirants. The influence of the Aryan accent, first noted by Verner, is seen in such examples as Sanskrit *ántara*, Gothic *anþar*, Anglo-Saxon and English *other* for *anþer*, with single shift only (*t* to *th*), because the accent precedes; but Sanskrit *antár*, Gothic *undar*, Anglo-Saxon and English *under*, with double shift (*t* through *th* to *d*), because the accent follows. The process extends in Anglo-Saxon and Norse to the organic voiceless spirant *s*, which similarly passes through *z* to *r*, as in Gothic *dins* for *dins*, Norse *dýr*, Anglo-Saxon *deor*, English *deer*. The second series of shifts is historical, no trace of it occurring in Gothic or in any extant Teutonic forms (geo-

graphical or personal names, etc.) before the 7th century. Its later appearance is also shown by the fact that it never spread to the whole of the Teutonic domain, but is mainly confined to the South German highlands, where the process was continued sporadically to about the close of the 11th century. The South German dialects were thus constituted a distinct group under the name of Hoch-Deutsch (i.e., "High German") in contradistinction to the Platt-Deutsch ("Flat" or "Lowland German") of the northern plains, which were unaffected by the process, and which consequently remain in their phonetics truer representatives of primitive Teutonic speech. The process itself is due to a general tendency to strengthen the mutes, so that the soft sonants *b, g, d* become hard surds *p, k, t*, while these become hard (voiceless) spirants (*pf* or *f, h* or *ch, ts* written *z*). Thus, the *Catti* of the Romans passes through such forms as *Chatti, Hatti, Hazi, Hassi*, to the modern *Hessians*; but the rotation is arrested at the hard spirants *f, h, th* of the prehistoric series (representing organic *p, k, t*), because these are incapable of further strengthening. Hence it is that the primitive Teutonic *f* and *h* persist in High German (Greek *κῶν*, Gothic *hunds*, Anglo-Saxon and German *hund*, English *hound*). Surd *th*, however, passes through sonant *dh* (*dh*) to *d*, and later further permutations take place (such as *z* to *ss*) in the Hoch-Deutsch group, which thus becomes historically differentiated into Old (7th to 11th century), Middle (12th to 15th century), and Modern High German. In general, the dental are much more fully carried out than the labial and guttural shiftings, so that the primitive surd *th* (as in *think*) passes through sonant *dh* (as in *then*) to *d* in the Low as well as in the High German group, but not in Anglo-Saxon and English, which thus stand phonetically on the same high level as Gothic itself—that is, nearest to organic Aryan speech. Hence it is that words like *three* (Gothic *threis*, Anglo-Saxon *threo*), *thorn* (Gothic *thauruns*, Anglo-Saxon *thorn*), etc., appear both in Low and High German with initial *d*: Dutch *drie, doorn*; German *drei, dorn*; all representing organic Aryan *t*, as in Sanskrit *tri*, Greek *τρεῖς*, etc. There are traces, however, of the tendency even in Gothic, surd *th* passing once or twice to *d*, just as in English *murther* (Anglo-Saxon *morþor*, Gothic *maurþor*) has become *murder*: as in some dialects *de, dey, dre* are heard for *the, they, three*. Other features distinguishing Teutonic from the sister Aryan tongues are:—(1) Unlaut, or modification of the root-vowel, a later development, being unknown in Gothic, by which the root-vowels *a, o, u*, and certain diphthongs are modified under the influence of an original *i* or *j*, in the following syllable, to which they tend to be assimilated. The inflecting vowels themselves tend to disappear, thus giving inflecting force to the unlauded vowels, as in Anglo-Saxon *fōt*, plural *fet*, from older *foti, fote, fite* = *fect*. (2) Great loss of nominal, adjectival, and especially of verbal grammatical forms; the seven organic cases are reduced to four (in English to two), with greatly weakened endings and consequent confusion of the

original stem declensions, while of the immensely rich Aryan verb little remains except two tenses (present and past), three moods (indicative, subjunctive, and infinitive) and the present and past participles. The middle and passive voices are entirely gone, those of the Norse group being later reconstructions. (3) The evolution of new and very peculiar nominal, adjectival and verbal processes (the so-called weak as opposed to the organic strong declensions and conjugation), the origin of which is involved in much obscurity. It is noteworthy that all these grammatical peculiarities pervade the whole Teutonic domain, so that the affinities of the several branches are determined, not so much by their inflecting forms as by their phonetic systems. All Teutonic languages must be grouped with one or other of the two main Low and High divisions, according as they are or are not affected by the later (historical) series of sound-shiftings, as in the subjoined table:—

Low German Division. **GOthic** (extinct). **NORSE**—Western Branch: Old Norwegian; Icelandic. Eastern Branch: Danish; Swedish. **NIEDER-DEUTSCH** Frisic, Netherlandish; Dutch; Flemish. Continental or Old Saxon. Anglo-Saxon: English; Scots. *High German Division.* **MITTEL-DEUTSCH**: Frankish (extinct). Thuringian: Neo-Saxon; Transylvanian. **OBER-DEUTSCH**—Burgundian: [Swiss.] Alemannic: [New High German (Literary Standard).] Bavarian: [Tirolese]; Austrian.

Teutonic Race, a main division of the peoples of Aryan speech [ARYAN], whose domain at the dawn of history (1st century B.C.) comprised nearly the whole of Central Europe between the Elbe and the Rhine, together with all Scandinavia, except the extreme north and Iceland. This domain has been maintained nearly intact throughout the historic period and greatly enlarged in various directions from time to time down to the present day. Most of the lands occupied by Teutonic peoples at the fall of the Western Empire—Lombardy, Burgundy, a great part of Gaul, the Iberian Peninsula, and the Roman province of Africa—have since been reoccupied either by the indigenous populations or by later intruders. But permanent additions were made to Teutonic territory by the irruption of Angles, Saxons, Frisians and others into Britain, by the continuous spread throughout the upper and middle Danube basin (Alsacia, Swabia, Franconia, parts of Helvetia and Rhetia, Upper and Lower Austria, parts of Bohemia and Transylvania), by encroachments on the western Slavs and Lithuanians in the Elbe basin, and eastwards to the Vistula (Pomerania, Brandenburg, West and East Prussia, Silesia), by the Norse occupation of Iceland and south-west Finland and, since the discovery of the New World, by the expansion of the British and others of Teutonic speech throughout nearly the whole of North America, South Africa and Australasia. Thus a great part of both temperate zones is now held by Teutonic peoples, numbering collectively about 195,000,000, of whom 115,000,000 belong to the Anglo-Saxon branch (English, Scots,

Anglo-Americans, Australasians, South Africans), 63,000,000 to the Germanic (Germans, Austrians, Swiss), 8,000,000 to the Netherlandish (Dutch, Flemings, Boers), and 9,000,000 to the Scandinavian (Danes, Swedes, Norwegians, Icelanders). When they first became known to the Romans the Teutonic peoples appear to have had no general national name; even the word *Germanus* applied to them collectively was not a native but a Celtic designation, of disputed origin, adopted by the Romans and from them by the modern English. Later, certain groups and confederacies were known as Teutones, Alemanni, Franks, Saxons, Suevi (Swabians), Thuringians, Boioarii (Bavarians), etc. Most of these names either remained localised, or disappeared, or became obsolete, while two acquired a general signification—Alemanni amongst the Romance peoples (whence the French *Allemand*, *Allemagne*, the Spanish *Alemania*, etc.), and Teutones amongst the Germani themselves, possibly through association with the *Tentoburgensis Saltus* (Teutoburger Wald), where Varus and his Roman legions were cut off by Arminius (A.D. 9). The word, being derived from a root meaning "people," "nation" (cf. Gothic *thiuda*; Anglo-Saxon *theod*, as in Orosius i. 11: "Dijnan them syndon manega theoda, ac hit man hat eall Germania"; *thiot Franceno* = "nation of the Franks," etc.), was easily generalised through such adjectival forms as Theodisc, Tudesk, Dintisk, Teutsch, Deutsch, whence the English *Dutch*, which, however, since the 17th century has been restricted to a small section of the race about the Rhine delta. Through long contact and interminglings with the contemporary Celtic, Slav, Lithuanian and perhaps earlier populations, the noble Germanic type, as known to the Romans and described by Tacitus—tall stature, florid complexion, blue eyes, flaxen hair, regular features—has almost everywhere undergone profound modifications and at present is more frequently seen in outlying territories (Great Britain, Scandinavia) than in the primitive Teutonic domain. In fact, the modern descendants of the Germani of Tacitus are not conspicuous for physical beauty in either sex, the bulk of the people being somewhat heavy, coarse-grained and ill-favoured, though still robust, vigorous and strong-limbed. But on the intellectual side every branch of the Teutonic race has progressed and with such names as Shakespeare, Bacon, Milton, Newton, Harvey, Scott, Burns, Meredith, Ibsen, Reynolds, Turner, Rabelais, Faraday, Darwin, Linné, Thorwaldsen, Kepler, Leibnitz, Kant, Goethe, Humboldt, Mozart, Handel, Beethoven, Wagner, Brahms, Grimm, stands almost admittedly at the head of modern European culture in its broadest sense.

Tewfik, MOHAMMED, Khedive of Egypt, was born on November 15th, 1852, and was educated in his native land, not in Europe, as were his younger brothers. In 1866, by a change in the order of succession, Tewfik became heir-apparent and succeeded his father Khedive Ismail in 1879. Though he had to face the rebellion under Arabi (1882), he had the common sense to recognise that Great Britain and France were the real masters of the

situation and throughout his reign co-operated loyally with Lord Cromer. He died in the Helouai Palace, near Cairo, on January 7th, 1892.

Tewkesbury, a town of Gloucestershire, England, at the junction of the Upper Avon and Severn—here crossed by a bridge of 170 feet



TEWKESBURY ABBEY.

span erected by Thomas Telford in 1824—10 miles N.E. of Gloucester, and 15 miles S.E. of Worcester. The cruciform church, which was formerly a Benedictine abbey, 317 feet long and 124 feet across the transepts, has a tower 123 feet high. It was restored in 1875-9 and, while in the main Norman, has Early English, Decorated and Perpendicular features, the west front being especially notable. The murdered Prince Edward (slain after the battle of May 4th, 1471, in which the Yorkists defeated the Lancastrians), son of Henry VI., was buried here, and there is a tablet to the author of *John Halifax, Gentleman* (Dinah Maria Mulock, afterwards Mrs. George Lilli Craik). Other buildings are the town hall, exchange, and grammar school, besides numerous beautiful examples of old timbered and gabled houses. The town once had manufactures of woollens and mustard, but is now chiefly a centre for the distribution of agricultural produce. Pop. (1901), 5,419.

Texas, the largest state of the United States of America, bounded on the N. by Oklahoma and Indian Territory, on the N.E. by Arkansas, on the E. by Louisiana, on the S. by the Gulf of Mexico and Mexico and on the W. by New Mexico. It length and breadth are 900 miles and 700 miles respectively, it has 400 miles of shore-line, and occupies 262,290 square miles. The seaboard is low and sandy, and the interior consists of prairie plateau and mountain. From the mouth of the Sabine river, which separates it from Louisiana, to that of the Rio Grande, which separates it from Mexico, the coast is fringed by low islands and peninsulas, enclosing wide lagoons and occupied by sand-hills. The longest island is Padre, north of Rio Grande, with a length of 100 miles. For several miles inland there is fertile alluvial soil.

consisting of fruitful plains alternated by barren tracts covered with cactus and mezquite. The district from Corpus Christi Bay to Rio Grande is called the Desert. Farther inland come well-timbered prairie-lands, and to these succeed bluffs and table-lands rising to the Llano Estacado, or Staked Plain. There is abundance of fertile and good grazing land, the soil, which is extremely varied, being best in the south and south-east, where rain is abundant. Maize, wheat, oats, barley, rye, potatoes and hay are the principal crops. Cotton, however, is the staple, while the wine-grape, fig and orange thrive. Enormous herds of cattle are raised and sheep, horses and swine also flourish. The climate of the lowlands on the coast is semi-tropical, tempered by the winds from the Gulf, that of the middle region is dry and healthy, and in the west it is so dry that meat will dry up without decaying. The whole state is subject to cold storms called "Northers." The chief rivers are the Red, Sabine, Neches, Trinity, Brazos, Colorado, San Antonio, Nueces and the Rio Grande, flowing into the Gulf. Among the minerals are coal, iron, copper, lead, bismuth, salt and petroleum. The industries include lumbering and timber products, cotton-ginning, the making of tobacco and cigars, flour- and grist-milling, carriage-building, textiles, saddlery, brick-making, brewing and distilling. Besides Austin, the capital (22,258), the chief towns are San Antonio (53,321), Houston (44,633), Dallas (42,638), Galveston (37,789), Fort Worth (26,688) and Waco (20,686). The Spaniards of Mexico attempted to settle the country, but the Comanche and Apache Indians rendered their efforts almost futile. In 1835 a rebellion led by Samuel Houston ended in the overthrow (April 21st, 1836) of Santa Anna, the Mexican President, at San Jacinto and achieved the independence of Texas, which was admitted as a State of the American Union in 1845. Pop. (1900), 3,048,710.

Texel, the largest of the Frisian Islands, forming part of the Dutch province of North Holland, separated from the southern mainland by the Marsdiep, a strait two miles wide. It is 15 miles long, 6 miles wide and covers an area of 67 square miles, the bulk of which yields excellent pasture for cattle and sheep. The people are engaged in dairy-farming. Numerous naval actions have been fought off the coast by Blake, Van Tromp, De Ruyter, Duncan and others. Pop., 6,000.

Thackeray, WILLIAM MAKEPEACE, novelist, was born on July 18th, 1811, at Calcutta, where his father was employed in the East India Company's civil service. In 1817, soon after his father's death, Thackeray came to England, where he was placed under the care of his aunt, Mrs. Ritchie, and when eleven he was sent to Charterhouse School, which figures in so many of his books and where his nose was broken in a fight with G. S. Venables, a schoolfellow who became a life-long friend. In 1829 he went to Trinity College, Cambridge, where he had among his contemporaries and friends Tennyson, Spedding and Edward

Fitzgerald. Leaving the university without taking his degree, he travelled for some time on the Continent, making long stays at Weimar, Rome and Paris, the last-named city always remaining one of his favourite haunts. He read for the bar, though apparently not with great energy, and contemplated making painting his profession, but want of success in his work and the loss of a comfortable fortune, through the failure of an Indian bank and the collapse of newspaper speculations, induced him to turn to literature as a means of livelihood. In 1836 he had married Isabella, the daughter of Colonel Shawe (who became insane in 1840 and died in 1892), and his circumstances appear to have been straitened for many years thereafter. All his early work is not known, but he became a regular contributor to *Fraser*, *The New Monthly*, and later to *Punch*, pouring out a quantity of sketches, stories, criticisms and poetry, but making no name with the general public. In 1840 he published his first book, *The Paris Sketch Book*, in 1841 *Comic Tales and Sketches*, while in the same year appeared *The Hogarty Diamond*, *The Shabby Gentle Story*, which was afterwards expanded into *Philip, Barry Lyndon*, a work full of powerful sarcasm, and *Men's Wives*. In 1843 he brought out his diary of a tour in Ireland as *The Irish Sketch Book*, and in 1846 the record of a journey to the East, *From Cornhill to Cairo*. It is not, however, by his early works, clever and able as they often are, that Thackeray has earned a place among great writers, but by his novels, of which the first began to come out in monthly parts in 1847 under the title of *Vanity Fair*. This first success, which firmly placed the author in popular favour, was followed by *Pendennis* (1848), *Esmond* (1852), *The Newcomes* (1853), *The Virginians* (1857) and *Philip* (1862). Thackeray paid two visits to the United States, where he was cordially welcomed, in 1852 lecturing on *The English Humorists of the 18th Century*, and in 1855 on *The Four Georges*, the profits of these lectures, which he also delivered in England, placing him in comfortable circumstances. In 1857 he stood as a Liberal for Oxford city, but was beaten by Edward (afterwards Viscount) Cardwell. In 1860 he was appointed the first editor of *The Cornhill*, in the pages of which magazine appeared *The Roundabout Papers*, *Lovel the Widower*, *Philip*, and *Denis Duval*, upon which he was at work when he died suddenly on December 24th, 1863. Of plot there is little in his novels, which are valuable rather for their author's profound insight into human nature, his hatred of all shams and his sympathy with whatever is pure and true, his humour and wit and his limpid style. He wrote verse of greater merit than that of many poets of more pretence.

Thalamifloræ, one of the two divisions or series into which polypetalous dicotyledons are divided. It is characterised by the hypogynous or thalamifloral insertion of the stamens—i.e., by their insertion directly on the thalamus or floral receptacle which has not, as it has in the other division (the Calycifloræ), grown out into a disc or

tube, the so-called calyx-tube. With hypogynous stamens, the ovary in this division is necessarily superior. The division includes, among others, the large orders Ranunculaceæ, Cruciferae, Violaceæ, Caryophyllaceæ, Guttiferae, Malvacæ, Geraniaceæ and Rutaceæ.

Thalberg, SIGISMUND, pianist and composer, was born at Geneva in 1812, and studied in Vienna under Hummel. His first public performance was at Prince Metternich's in 1826. He earned both fame and riches in his tours through Belgium, Holland, England, and Russia (1839), the United States (1855), and Brazil (1855, 1862). In 1858 he settled at Naples, where he died on April 27th, 1871. He published numerous compositions for the piano, his first being a "Fantasia on Airs from *Euryanthe*" (1828). His operas, *Cristina* and *Florinda*, were both failures. As an executant he was brilliant; his touch was delicate, his expression pure and his *technique* masterly.

Thales, one of the Seven Wise Men of Greece, was born at Miletus in Ionia, Asia Minor, in 610 B.C. He taught that all things are modes of water, and is regarded as the founder of Greek astronomy (it seems pretty well authenticated that he foretold the eclipse of the sun which took place in 585) and the geometry of lines, and established the school of Ionian philosophy. He died in 546.

Thaliacea, one of the three orders of Ascidians, including those with barrel-shaped bodies and thin delicate tests or mantles. They are all free-swimming. The most interesting point about the order is that in both families (Doliolidae and Salpidæ) there is an alternation of generations.

Thallium (chemical symbol, Tl; atomic weight, 204), a metallic element which was first discovered by Sir William Crookes in 1861, when examining the spectrum of some dust deposits from sulphuric acid chambers. It has since been shown to be found in many varieties of pyrites, in numerous mineral waters and a few minerals. The metal itself is very soft and can be scratched with the finger nail. It may be drawn into wire and beaten into foil. It has a bluish-white colour and is distinctly crystalline, a bar of the metal emitting a peculiar crackling sound if bent. It melts at about 300° C., readily oxidises and, if heated sufficiently, may burn with a bright green light. It forms a well-defined series of thallous salts corresponding to the oxide Tl₂O. Of these the chloride is almost insoluble like that of lead, differing, however, in the ready solubility of the sulphate.

Thallophyta, the lowest sub-kingdom of the vegetable world, comprising some plants in which sexual reproduction does not seem to have made its appearance, others in which propagation is direct and not cyclical and others again in which the alternation of generations, though present, is rendered irregular by the intercalation of various asexually-produced generations or gonidia. In the first class, which comprises minute unicellular plants, reproduction consists merely in cell-division.

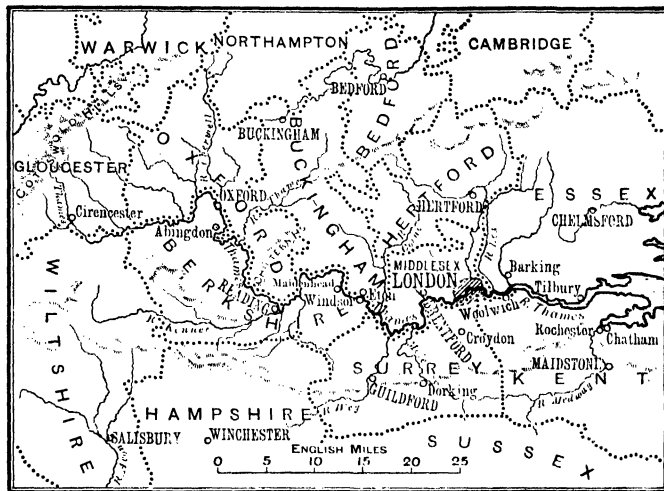
In the second class, comprising many filamentous forms, the gametes conjugate and produce a cell, the zygospore or oöspore, which develops directly into a gametophyte, so that there is no sporophyte or alternation. The name thallophyte is taken from the fact that there is very rarely in this sub-kingdom anything like a differentiation of stem and leaf, the whole plant being a thallus. The thallus may be unicellular, cœnocyctic, or multicellular; but the cell-walls, though sometimes thickened or mucilaginous, are never lignified, nor is there any marked differentiation of tissues. Nevertheless, between the simplest Schizomycete and the higher Algae and Fungi there is an enormous difference in complexity. The most satisfactory subdivision of the sub-kingdom is into the two great groups or classes, the Algae and the Fungi, since the presence of chlorophyll in the former and its absence in the latter is correlated with other characters.

Thallus, a plant body which is either unsegmented, or, if segmented, segmented only into similar members—*i.e.*, in some cases branched, but exhibiting no differentiation into root and shoot, or into stem and leaf. Thus among the lower Thallophyta, in which there is no alternation of generations, the thallus may be a single spherical cell, or a spherical cœnobium with multilateral symmetry; or it may be filamentous, with or without branches. The thallus of the higher Algae and Fungi is far more complex; but it is a structure which is represented outside the sub-kingdom Thallophyta, as by the dorsiventral dichotomous gametophyte of most Hepaticæ, by fern prothallia, by the archisperm in all spermatophytes, and by the main body of the minute rootless duckweed, *Wolffia arrhiza*.

Thames, THE, takes its rise in the Cotswolds in Gloucestershire, its early feeders consisting of the Churn, Coln and Leach. In passing Oxford it receives the name of Isis and becomes for certain the Thames after receiving the Thame at Cirencester, though customarily and rightly it bears this name from source to sea. It flows past Reading—where it receives the Kennet—Great Marlow, Maidenhead, Windsor, Staines, Kingston, Richmond, London, Greenwich, Woolwich and Gravesend, where the estuary begins. The chief tributaries on the left bank are the Churn, Coln, Leach, Windrush, Evenlode, Cherwell, Thame, Colne, Lea and Roding, and on the right, the Ock, Kennet, Loddon, Wey, Wandle, Mole, Darent and Medway. Its course to the Nore is 250 miles long, or 120 miles in a direct line. At London Bridge the width is 290 yards, at Woolwich 490 yards, at Gravesend 1,200 yards, and at the Nore Lightship 6 m.s. Including those at Ilfey and Richmond, there are 34 locks below Oxford, at some of which on a Sunday in the season (notably at Boulter's Lock above Maidenhead Bridge) the scene is brilliant and animated in the extreme. Of the bridges on its lower course London Bridge is the oldest, and the magnificent bascule Tower Bridge, the most easterly, one of the newest. The part of the river immediately below London Bridge is called the

Pool, and that, with the lower portions, constitutes the Port of London. Ships of 800 tons can come up to St. Katherine's Dock, while the lower docks, especially those of Tilbury, will accommodate the largest vessels. The Thames in London has been greatly improved by the Embankments (the Victoria from Blackfriars Bridge to Westminster; the Albert from the southern end of Westminster Bridge to Vauxhall; and Chelsea from Grosvenor Road to Battersea Bridge). The Thames is called the Royal River from the facts that Windsor Castle lies on its southern shore and the Tower of London on its northern bank, and that it passes through the greatest city on earth. It is also the stream of pleasure, affording at Henley the course for the races in the famous regatta, from Putney to Mortlake the course for the 'Varsity boat-race, and from London Bridge to Chelsea the course for the watermen's race for the Doggett Coat and Badge. The two most popular river trips are those from Kingston to Oxford (which requires two days) in order to view the beautiful and romantic scenery of the upper reaches, and the daylight trips to Ramsgate and other Kentish watering-places by the *Royal Sovereign* and *Koh-i-noor*. The Thames Tunnel from Wapping to Rotherhithe, constructed in 1835-43 by Sir Mark Isambard Brunel, was transformed from a footway to a double line of railway in 1865; and in 1897 was opened Blackwall

Thane (*thegn*), an Anglo-Saxon title, which seems to have originally signified "one of mature age" and hence a soldier. Later it acquired the same meaning as *gesith*, that is, a member of the



SKETCH-MAP OF THE THAMES FROM SOURCE TO MOUTH.

king's *comitatus* or personal following; but, as the thanes received grants from the royal demesne, the term came to imply the holding of land and eventually denoted any landowner whose estate exceeded five hides. The king's thegns were those who held directly from the king. After the Conquest many of the thegns passed easily and naturally into the knightly order under the Norman kings of England.

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LONDON BRIDGE.

(Photo: R. W. Thomas, Cheapside, London, E.C.)

Tunnel, sufficiently commodious to take vehicular as well as pedestrian traffic. There are also steam ferries from Woolwich to North Woolwich and from Gravesend to Tilbury. In its course the Thames separates Oxford, Buckingham, Middlesex and Essex on the north, from Wiltshire, Berkshire, Surrey and Kent on the south.

Thanet, ISLE OF, forming the north-eastern corner of Kent, England, bounded on the N. and E. by the North Sea, on the S. by Pegwell Bay and on the W. by the rest of the shire. It occupies an area of fully 40 square miles and is now an island in name only, being separated from the rest of the county by the Stour and a brook which represents the ancient Wansum channel. Its dimensions are 9 miles from east to west, and 5 miles from north to south. It contains the popular watering-places of Margate, Broadstairs and Ramsgate. The coast-line is composed of chalk cliffs of a varying height of from 50 to 100 feet, on one of which at the extreme easterly point, the North Foreland, stands a well-known lighthouse. Pop. (1901), 68,344.

Thanet Sands, a series of pale-yellow, or occasionally greenish, sands, forming the base of the Eocene system in the London basin in England, corresponding to the *sables de Bracheux* of the

Paris area, but not represented in Hampshire. They contain some clay partings and at their base the "Bull-head bed" of green-coated flints resting on the Chalk. In the Isle of Thanet they reach a thickness of 60 feet, but thin away at Sudbury (Suffolk) and Faling (Middlesex). Though fossils are rare in these beds, some 70 species, mostly marine, have been found, including sharks'-teeth, a nautilus, an oyster and many other pelecypods, and several foraminifera.

Thaulow, FRITZ, landscape painter, was born in 1848 at Christiania, Norway. He studied for a short time at the Academy in Copenhagen and then for two years at Carlsruhe under his compatriot Gude. In 1880 he settled in Paris. His pictures were at first rejected at the Salon, but his talent was recognised in 1889 when he exhibited some of his snow scenes, one of which was bought for the Luxembourg Museum, and Thaulow himself was decorated with the Legion of Honour. He is now generally regarded as the chief representative of Norwegian landscape painting and as the innovator of a more natural style. From the beginning he waged war against the conventional art of the day and the antiquated traditions of the Düsseldorf School and, together with Krohg, Gerhard Munthe, Hezlerdahl and other Norwegian painters, introduced into practice the naturalistic art theories which had been expounded in the 'sixties by a Norwegian society whose president and vice-president were Björnson and Ibsen. Thaulow was the painter of running water, the snow and moonlight nights, of unpretentious nature in Norway, Holland and Normandy. The best of his work excels in its freshness and simplicity and its intensity of truth and poetic feeling. But latterly his sincerity of purpose became less, elegance took possession of his palette, and his art relapsed into routine. He was a regular exhibitor at the Paris Salon, at the Royal Academy and the International Society in London. He died at Volendam in Holland on November 4th, 1906.

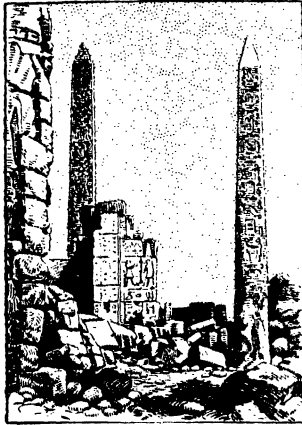
Theatre (Greek *theatron*, "a place for seeing"), a building intended for dramatic representations. Edifices of this kind originated in Greece, the details of their plan being determined by the requirements which arose with the development of the Attic drama. The form ultimately assumed was that of a segment of a circle, the seats of the audience, which ascended the sides of a natural hollow, in tiers corresponding to the arc, whilst the stage (*proskénion*) ran along the base. The *koilon* occupied by the spectators had a sweep of somewhat more than a semicircle, the space immediately below them in front of the *proskénion* being the *orchestra*, the most ancient and most important part of the whole structure. In its centre stood the altar of Dionysus, round which the chorus sang and danced, recalling the sacred origin of the spectacle. On those rare occasions when they took an active part in the drama, they mounted the flight of steps leading from the orchestra to the *proskénion*. Behind the *proskénion* rose the *skene*, a stone wall containing three doors, which

communicated with the actors' dressing-rooms. It was usually ornamented with columns and entablatures so as to resemble the front of a palace or temple. If this scene was not suitable, curtains were hung in front of it, or wooden scenery was introduced as a background. Stage devices were largely used, the most celebrated being the *mechane*, by which gods were lowered from the clouds. The most ancient Greek theatre of which there are any remains is that of Dionysus at Athens. The Roman theatres resembled the Greek in most respects, but they were generally built on level ground and the orchestra was occupied by the seats of senators. The mysteries and miracle plays of the Middle Ages were performed in churches, monasteries, or temporary booths, with no scenery but a scaffold in three stages to represent heaven, earth and the infernal regions. A building for secular plays was opened in Paris by the Confraternity of the Passion about 1548, and before the close of the 16th century several theatres modelled on that of Vitruvius had been erected in Italy. Those in which the plays of Shakespeare and his contemporaries were first acted had a more homely origin. The theatre at Shoreditch, built by James Burbage in 1576, preserved all the features of the inn-yards in which the bands of strolling players had been wont to entertain their uncritical audience. The stage was a platform surrounded by the pit or "yard" on all sides but one, where it communicated with the green-room or "tiring-house." The galleries of the inn-yard reappeared in the rows of boxes or "rooms," which ran round the whole area. As regards scenery, with the exception of a few articles of furniture and similar objects, the only aid given to the imagination was a label on which the locality was written. The "Curtain" in Shoreditch was built soon after the "Theatre," which in 1598 was re-erected in Southwark, its name being changed to the "Globe." Under this title it became famous in connection with Shakespeare. Both the "Globe" and the "Swan" (1592), a contemporary drawing of which remains, were octagonal wooden structures, whereas the "Fortune" (1599-1600) was square. Two important changes were made immediately after the Restoration—the introduction of movable scenery and the appearance of women in the female parts (hitherto sustained by boys). At the same time there began a gradual alteration in the internal arrangements, which continued till the middle of the 18th century. The details of construction had by that time become pretty well established and it has not since been found necessary to introduce many modifications. By the 6 and 7 Vict., cap. 68, the licensing of theatres in England became a function of the Lord Chamberlain in London and the immediate vicinity; elsewhere of the justices of the peace. But by the Local Government Act of 1888 the place of these latter authorities was taken by the County Councils, which, however, frequently depute their power to the justices.

Thebaine ($C_{19}H_{23}NO_3$) is an alkaloid which occurs associated with morphine in opium. It forms small plates with a silvery lustre, which melt

at 180° C. It is insoluble in water, but is readily dissolved by warm alcohol and by acids. In its chemical constitution it is closely allied to morphine, which it resembles also in its chemical behaviour, being, however, much more poisonous.

Thebes, the "hundred-gated" city of Homer, now in ruins, was once the capital of Upper Egypt and is still a place of interest to the antiquary and the ethnologist. It is situated in 26° N., on the



THEBES—REMAINS AT KARNAK.

left bank of the Nile, in the broadest part of the Nile Valley, upon a broad and cultivated plain. It was the centre of the worship of Ammon and is the No or No-Ammon of the Old Testament. By the Greeks it was also called Diospolis, or the City of Jove. Besides many temples, it contained the "vocal" Memnon and another statue of great interest. The remains of Luxor and Karnak stand opposite to it on the right bank of the river. Some of the buildings are said to date from 2500 B.C., and the city's most flourishing period was from 1600 to 1100 B.C., when it took the place of Memphis as capital. Its central position gave it safety. In 1100 Memphis again became the capital. In the 6th century B.C. Cambyzes plundered Thebes, and at a later period it was injured by the rise of Alexandria. In early Christian times its remoteness made it a favourite abode of Christians and the monks and hermits of the Thebaid were numerous. Of the principal temples one has a statue of the founder, 60 feet high; there are two temples of Amenoph III., a terraced temple of Queen Hatshepsut, near which some valuable mummies were found, a great temple of Ramesses III., with paintings illustrating victories, etc., 17 tombs of the queens and tombs of kings. The temples and other remains at Luxor and Karnak are equally interesting. Charles Kingsley utilises the Thebaid in the early part of *Hyppatia*.

Thebes, the ancient capital of Bœotia in Greece, was situated between the Dirce and Ismenus, 4½ miles N.W. of Athens. Its Akropolis was called Cadmeia from Cadmus, whom tradition declared to be the founder of the city. Dionysus, Hercules, Amphion and Tiresias were born here, and it was here that the Greek tragedians found material for the plays that centred around the story of Œdipus. Owing to a quarrel with Athens, Thebes sided with the Spartans in the Peloponnesian

War, but afterwards repented and withdrew from the alliance. The victories of Epaminondas at Leuctra (371 B.C.) and Mantinea (362 B.C.) gave Thebes a temporary supremacy, but the defeat at Chæronea (338 B.C.) was the beginning of its downfall. After the death of Philip of Macedon the Thebans tried to regain their independence, but Alexander destroyed the city and sold the inhabitants as slaves. The modern city occupies the site of the citadel. Pop. (estimated), 3,000.

Theca, a genus of fossils ranging from the Cambrian to the Permian periods, but most characteristic of the former; it is of interest as it is one of the best known of the group regarded as Palæozoic Pteropoda. It is, however, very doubtful whether it really belongs to that order and its correct name is Hyolithes.

Thecaphora, the Zoophytes of the sub-order of Hydroids, in which the zooids or individuals of the colony are protected by cups or theca. The best-known families in it are the Campanulariidae, Sertulariidae and Plumulariidae, which include many of the most familiar of the English Sea-firs. The group is wholly marine; the fossil forms assigned to it are of little interest.

Thecidiidae, a family of Brachiopoda ranging from the Carboniferous period to the present time. The members of it are fixed by the beak to some body, while the margin of the shell is much thickened; it thus assumes a form very different from those of most Brachiopoda. One of the most remarkable genera included in the family is the genus *Oldhamia* from the Carboniferous rocks of India.

Theciidae, a family of fossil corals found in the Silurian rocks. Its structure is very abnormal; it is now assigned to the *Perforata* and regarded as an ally of the *Favositidae*. The best-known form is *Thecia swindernana* of the Wenlock Limestone.

Thecosomata, the order of Pteropoda which includes those members of this class in which the body is protected by a mantle fold and a shell. It includes three living families, of which the Hyalidae is the best known; the two Palæozoic families of *Conularidae* and *Theciidae* are included here, but it is doubtful whether these are really Pteropods, the latter, indeed, being now grouped with the Corals.

Theft, or, in legal parlance, LARCENY, is the felonious taking and carrying away of the personal goods of anyone from his or her possession with intent to convert them to the use of the offender without the consent of the true owner. Larceny was formerly distinguished into grand and petty larceny, the former including the stealing of goods above the value of 12d., the latter of that value or under. This distinction was abolished by a statute passed in the reign of George IV., and now all larcenies are subject to the same incidents as grand larceny. Larceny is sometimes distinguished as simple and compound, the former being larceny of goods only, the latter larceny from the person or

habitation of the owner. The law regarding this offence is now consolidated by the 24 and 25 Vict., cap. 96, which renders also many things (both animate and inanimate) the subjects of larceny, which for several reasons were not so prior to that Act.

Theine. [CAFFEINE.]

Theism, a term applicable to any system of belief which takes as its starting-point belief in the existence of One Personal God. It is thus opposed on different grounds to Atheism, Agnosticism, Pantheism and Polytheism. Theism differs from Deism in that the latter of necessity rejects all revelations lying outside and beyond the course of nature and denies that God sustains the world which He has created, whereas Theism assumes, but does not define, a living relation between God and His creatures, while, strictly at least, excluding revelation.

Thellusson, PETER, merchant, was born in Paris on June 27th, 1737, of a family which sought the hospitality of Switzerland at the time of the massacre of St. Bartholomew in 1572. His father represented Geneva at the Court of France. Peter went to England in 1762, became a naturalised citizen in the same year and settled in London as an agent for several houses in Paris and Amsterdam. He afterwards traded on his own account with the West Indies and acquired a large fortune. He died at Plaistow, near Bromley in Kent, on July 21st, 1797. He lives in history because of a notorious and eccentric will. He left £100,000 to his wife and children, and the rest of his fortune, amounting to from £600,000 to £800,000, was to accumulate during the lives of his sons and grandsons and of their issue at the time of his death. When the last survivor died his trustees were to divide the estate equally among the "eldest male lineal descendants of his three sons then living." Failing an heir, the property was to go towards extinguishing the National Debt. When Thellusson died he had no great-grandchild and the trust therefore was limited to two generations. The family tried to get the will set aside, but Lord Chancellor Loughborough declared it valid. As it was thought that the trust might reach the sum of £140,000,000, such a will was regarded as a possible menace to the stability of the community and an Act was passed in 1800 prohibiting similar bequests in future. In fact, however, such had been the costliness of litigation and so great the mismanagement that when the estate was at last divided, it yielded only a moderate fortune to the two participants.

Themistocles, the celebrated general and statesman, was born in Athens towards the close of the 6th century B.C., possibly about 514. He adopted a public career and after the ostracism of his rival Aristides (483) became the foremost man at Athens, and directed his energies to the formation of a powerful fleet, thus laying the foundations of the city's naval supremacy. In the war against Persia the chief command was given to the Spartan Eurybiades, but it was the action of Themistocles in forcing an engagement which led to the naval

victory over Xerxes at Salamis (480). When the Persians had been driven out he accomplished the fortification of Athens and the Piræus in spite of Spartan opposition; but the unpatriotic faction ultimately prevailed and in 471 he was ostracised. Expelled from Argos and Coreyra in turn, he at last found a refuge at the court of Artaxerxes, King of Persia, over whom he acquired great influence. He died, still in exile, at Magnesia in Asia Minor about 450 B.C.

Theobald, LEWIS, editor of Shakespeare's works, was born at Sittingbourne in Kent in 1688 and was educated by the Rev. M. Ellis of Isleworth. His classical attainments were more than considerable and enabled him, after he had discarded his father's profession of the law for which he had neither aptitude nor liking, to translate with remarkable skill several of the plays of Sophocles and Aristophanes. He settled down to the humble calling of a literary hack but, having excited Alexander Pope's wrath by his animadversions in *Shakespeare Restored* (1726) on Pope's poor edition of Shakespeare, was pilloried by the spiteful poet as the hero of the first edition of the *Dunciad* (1728). Meanwhile, in the midst of many drawbacks due to his poverty, Theobald was engaged upon his own edition of Shakespeare, which at last appeared in March 1734. It proved to be the first edition in which adequate trained attention was paid to the dramatist's text and became popular. Though it brought him a large sum of money Theobald had not the knack of managing his own affairs and in due course fell into straits again. He died in London on September 8th, 1744. On the death of Lawrence Eusden in 1730 it was thought that Theobald would be appointed Poet Laureate, but he was set aside in favour of Colley Cibber.

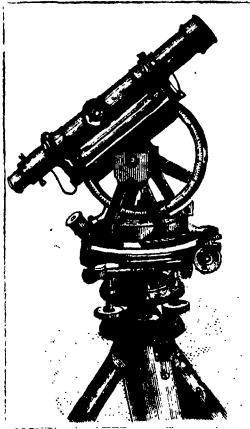
Theobalds. [TEMPLE BAR.]

Theobromine, $C_7H_8N_2O_6$, occurs largely in the cocoa bean (*Theobroma cacao*), from which it may be obtained by boiling with water, adding lead acetate, evaporating and extracting the residue with alcohol. It forms small crystals of the Rhombic system, which sublime if carefully heated. It has a slightly bitter taste and dissolves to a small extent in water and alcohol. It forms salts with acids, most of which are, however, decomposed by water. Its constitution is very similar to that of theine or caffeine, and xanthine, the compound being dimethyl xanthine, $C_7H_2(CH_3)_2N_2O_6$, while theine possesses the constitution of trimethyl xanthine. The chemical deportment of these substances is also, as would be expected, very similar.

Theocritus, the great pastoral poet of Greece, was born at Syracuse in Sicily in the early part of the 3rd century B.C. All that is known of his life is that he possibly studied medicine in the island of Cos off the western coast of Asia Minor, numbered the poet Aratus and the physicians Nicias and Philinus among his friends, and passed many years at the court of Ptolemy Philadelphus in Alexandria. In his rural *eidyllia* ("idylls," little pictures) the life of Sicilian shepherds and fishermen is brought

before us with a simplicity and freshness which can never lose their charm. Others of his poems give an equally vivid picture of the life in great towns; a third class deals in epic style with themes derived from the ancient mythology; and to these must be added epigrams, *vers de société* and courtly addresses to Ptolemy and Hiero. Many of the poems are written in the form of dialogues. They are all in the Doric dialect and were doubtless suggested by the popular poetry of the age. Virgil, in his *Eclogues*, closely follows Theocritus.

Theodolite, a portable instrument employed in land-surveying for measuring horizontal and vertical angles. A telescope is fitted on bearings, so that it can rotate about a horizontal axis at right angles



THEODOLITE.

to its optical axis, and a graduated circle is provided for observing the amount of such turning; the uprights which support the telescope are fixed to a circular horizontal plate capable of being rotated on a vertical axis. This plate is also graduated on its edge and verniers are provided for each circle. The whole is fixed to a tripod stand, and screws and levels are provided to enable the horizontal disc to set truly horizontal. A magnetic compass is also fitted to the horizontal plate. To use the instrument it

is levelled, an object is sighted in the telescope and the reading on the circle is noted; if now another object is sighted and a fresh reading taken, the difference between the two readings will give the angle between lines joining these two objects with the centre of the instrument.

Theodora, the wife of the Emperor Justinian, was born, probably in Constantinople, early in the 5th century. Her father was bear-feeder at the amphitheatre and in early life she appears to have been an actress, delighting her audiences by her vivacity and impudence, for she had no gift either for music or dancing. During her youth, too, she seems to have acquired some notoriety as a courtesan. Justinian, nephew of the Emperor Justin, becoming enamoured of her, succeeded not only in overcoming the Imperial objections to the marriage, but also secured the repeal of the law prohibiting such alliances. When Justinian ascended the throne in 527, Theodora discovered a remarkable capacity for administration and her husband left the reins of government in her hands. Her courage in the insurrection of 532 saved the crown and palace and so completely was she identified with the sovereignty that officials took

the oath of allegiance to her as well as to Justinian and she acted, in modern language, as foreign secretary. Though she ruled tyrannically, she stood by her friends. Of frail physique and delicate constitution, she died in 547, comparatively young. She was of slight and graceful figure, had beautiful features, a pale countenance and a piercing eye. Her strange fortunes have appealed to the dramatist, Victorien Sardou's *Theodora* (produced at Paris in 1884) being the best-known play dealing with the Empress.

Theodora, the wife of the Emperor Theophilus and Empress of the East in 830. She was a Christian and resisted the Iconoclastic movement with all her force. She became regent in 842, while her infamous son, Michael III., was a minor, and ruled with much wisdom and strength. Her son, a monster of iniquity, deposed and imprisoned her in 857. She had subdued several of the savage tribes who threatened her empire, converted several potentates and placed St. Ignatius on the patriarchal throne of Constantinople. She died in 867 and is considered a saint by the Greek Church.

Theodore, Archbishop of Canterbury, was born of a Christian family at Tarsus in Cilicia in 602, and was educated in his native city and at Athens, becoming distinguished for his acquirements. In 668, whilst at Rome, he was appointed to the see of Canterbury, where he arrived in 669. He is generally credited with having begun the foundation of English scholarship by making the monasteries repositories of classical learning. He deposed Wilfrid in Northumberland—but his decree was reversed on appeal to the Pope—and held two synods, one at Hereford in 673 and one at Hatfield in 680. He was reconciled to Wilfrid and reinstated him before his death, which occurred at Canterbury on September 19th, 690. He was a man of large views, strong will and autocratic disposition, but in private life gentle and affectionate. It is said that he was the first to organise the English Church on a grand scale and to provide it with a proper constitution.

Theodoric the Great, King of the Ostrogoths or East Goths, was born about 454 at Vienna, and became a dreaded power to the Byzantine Emperors, who had failed to pay a tribute to the East Goths. In 488 he undertook the chief enterprise of his life, the conquest of Italy, then under Odoacer. The latter, being defeated in several battles, fled to Ravenna where, after a prolonged siege, he at length capitulated. Theodoric broke his faith infamously by slaying Odoacer with his own hand on March 15th, 493. Now began his long reign in Italy, during which the country enjoyed almost unbroken peace and prosperity for thirty-three years. Theodoric died on August 30th, 526, and was buried in Ravenna, where his mausoleum is still one of the sights of the city.

Theodosius the Great, Roman Emperor, was born at Galicia, in Spain, about 346, and entered the army in youth, serving till the death of his father in 376. He was appointed administrator of the Eastern Empire by Gratian about 378 and

repelled the Gothic invasion on two occasions. His ruthless massacre of 7,000 of the inhabitants of Thessalonica, in revenge for the murder of one of his officers, remains the greatest blot on his reign. After the revolt of Maximus against Gratian and the murder of the latter (383), he opposed Maximus and finally defeated and killed him, entering Rome in triumph in 388. In 392 and again in 394 he routed the forces of Arbogastes and Eugenius, who had deposed and murdered Valentinian II., whose sister Galla he had married, and died at Milan on January 17th, 395. He finally destroyed paganism by merciless penalties and may be said to have checked the spread of the Arian heresy.

Theognis, the elegiac poet, was born at Megara in Greece about the middle of the 6th century B.C. He belonged to a family which was the ruling party in his native place. Hence the gaiety of his earlier pieces; but, after the triumph of the democratic party and the confiscation of the property of the aristocrats, his poetry became more mournful in character and took an elegiac turn. He is considered the most remarkable of the Gnomic poets and was ranked high as a moralist among the ancient Greeks. The date of his death is unknown, but it is supposed that it occurred about 485. Only a few fragments of his verse remain. They were first published under the name of *Sentences* by Aldus in Venice in 1495.

Theology, the body of doctrine which treats of the nature of God and the relation between God and man. The term came into use in the Christian Church in connection with the doctrine of the Logos and was applied especially to St. John. It afterwards acquired a wider signification. Theology is distinguished as either (1) Natural, or (2) Supernatural or Positive. The former is given by the light of nature; the latter comes through a special revelation, at once confirming the truths accessible to the unaided reason and imparting others which would not otherwise have been known. Apart from this general division, theology comprises various branches, such as (1) Apologetical Theology, which is concerned with the evidences of religion and the authenticity of the Scriptures; (2) Exegetical Theology, or Hermeneutics, which aims at interpreting and explaining the Bible; (3) Dogmatic Theology, which gives a systematic exposition of the dogmas on which the faith of the Church is built up; and (4) Polemic Theology, which defends the doctrines thus established and refutes heretical views. Practical theology embraces not only Christian ethics, but Pastoral theology (which treats of the intercourse of the pastor with his flock) and questions concerning Church government and ecclesiastical discipline.

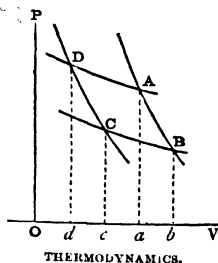
Theophrastus, philosopher, was born about 371 B.C. at Eresus in Lesbos. He studied under Plato and Aristotle in Athens and succeeded the latter as head of the Peripatetic School in that city. He was an expounder of the Aristotelian philosophy and wrote various works, many of which are lost. The most notable of his productions is the one entitled *Characters*, an exposure of

the follies and vices of mankind, which was imitated and translated by La Bruyère. Some of his works were botanical treatises, and others deal with metaphysics, etc. He died in Athens in 288 B.C. An edition of his remains was published in Leipzig in five volumes (1818-21).

Theosophy, a form of religious speculation, which consists in assigning attributes and characteristics to the Deity and showing how the origin and order of the universe are determined by the Divine nature. It cannot be properly regarded as a branch of philosophy, since, in its search for truth, it lays claim to a special revelation, or, at any rate, trusts to an illuminated faith rather than the exercise of the intellect on the material furnished by experience; yet the theosophist and the transcendental metaphysician have much in common and the intellectual career of Friedrich Wilhelm Schelling (1775-1854) shows how easily the one may pass into the other. As regards actual Theosophic systems, it is not too much to say that they all originated in the fervid imagination of the East. Through the progress of the Roman arms the theogonies and cosmologies of various Asiatic races became known to the Western world and, amidst the spiritual ferment which accompanied the decay of the Roman Empire, Theosophy thrived apace, reaching its full flower in the elaborate systems of the Neoplatonists and the Gnostics. During the Middle Ages it was usually associated with Mysticism and both the writings of the mystics and the nature-philosophy of the Renaissance exercised much influence over the mind of Jakob Boehme (1575-1624). The progress of Rationalism, which was the natural outcome of the Reformation, seemed to have given its death-blow to Theosophy; but in recent years a new type, derived directly from the East, has attracted many followers in Western Europe, perhaps through a reaction against the materialism of the age. The chief exponent of the new doctrine was Helena Petrovna Blavatsky (1831-91), who alleged that she had gained her knowledge of esoteric Buddhism in Tibet, where the Theosophical Society claims to have been founded in 1875. Another zealous exponent was Annie Besant (b. 1847), so well known in London for many years in connection with the School Board and Socialist propagandism.

Therapeutics (from a Greek word signifying "to heal"), the science which deals with the use of various remedial agents in the treatment of disease. Inquiry concerning the physical and chemical properties of the materials used, of the sources from which they are obtained and of the methods of compounding them, constitutes the study of materia medica. On the other hand, therapeutics proper is held to deal more particularly with the action and uses of drugs; with anti-toxins and anti-serums; inoculation; the employment of organs or extracts thereof, such as pepsine, thyroid gland, bone-marrow, suprarenal capsule, thymus, raw meat,—a method of treatment which is more particularly known as organotherapeutics; dietaries, "cures," baths and exercise.

Thermodynamics, a modern branch of the science of heat, founded chiefly upon the deductions of James Prescott Joule (1818-89), Sadi Nicolas Léonard Carnot (1796-1832) and other workers in the same field. Two fundamental principles underlie this science. The first law of thermodynamics states that when heat is used in doing work, the work done is exactly the equivalent of the heat expended, and when work is done to produce heat, the heat produced is exactly proportional to the work done. This follows from the law of the conservation of energy, when it is accepted that heat is a form of energy. But only in modern times has heat been universally regarded as energy; it is true that some of the early Greek philosophers considered it as in some way connected with motion, and speculations on the dynamical theory of heat were rife in the time of Bacon, but by far the greater number of scientists held the opinion that heat was a sort of elastic fluid permeating all bodies—bodies becoming hotter as more of this fluid or caloric was given to them and colder as it was taken away. Caloric, like matter, was indestructible and uncreatable, and it was finally decided that it was weightless, though much doubt had previously existed on the subject. But everything could not be satisfactorily explained by the caloric theory. Friction was known to generate heat, and when a body was ground to powder it was supposed to lose some caloric, which raised its temperature, the heat capacity of the powder being therefore assumed to be less than that of the original solid. Count Rumford proved the error of this assumption by actual experiment in 1798, but did not succeed in convincing the caloricists. He concluded that motion was at the root of the matter, and Sir H. Davy followed with similar reasoning. In 1840, however, Joule experimentally determined the numerical relation between work spent and heat generated, and stated that 772 foot-pounds of work were capable of raising one pound of water through one degree Fahrenheit. This may be written $w = 772 H$. With different units the number will alter, and in general terms the equation is written $w = J H$, J being called the mechanical equivalent of heat. Experiments were also made of the reverse problem—the determination of the amount of work done by the expenditure of a certain amount of heat—and Hirn showed the connection between the heat given out by the boiler of an ordinary steam-engine and the work done in the same time, allowing for the heat received by the condenser and that lost by radiation, etc. Almost



countless experiments have been made to determine the true value of J , the names including Joule, Faire, Hirn, Weber, and workers at the present time, an enormous number of direct and indirect methods having been employed.

The second law of thermodynamics is expressed

by Clausius thus:—"It is impossible for a self-acting machine, unaided by an external agency, to convey heat from one body to another at a higher temperature"; while Lord Kelvin states that "it is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects." We may take any two substances at different temperatures and theoretically allow the pair to do work. A heat engine is therefore imagined—the body at the higher temperature being regarded as the furnace and that at the lower as the condenser; the work done is equivalent to the difference of the heat obtained from the furnace and given to the condenser. Heat cannot of itself pass from a colder to a warmer body, but, if work be done, then heat can be withdrawn from the cooler condenser and given up to the hotter source. This involves the conception of a reversible engine and considerations of such a machine were first investigated by Carnot. If a substance be allowed to expand against pressure, it does external work, but it does not follow that this external work is at all the equivalent of the heat expended; internal work may also have been done in overcoming molecular attraction, surface tension, electrical forces and so on. But we may take our substance through a cycle of operations and finish with it in exactly the same state as it was at starting, in which case we get rid of the unknown quantities included under the name of internal work. In the final enumeration of effects, whatever the external work may have been, the internal work cancels out. Let us take a working substance and subject it to certain alterations of temperature, pressure and volume. If we take distances measured in the direction $O V$ to represent volumes and those in the direction $O P$ to represent pressures, then the state of a substance represented by A is such that its volume is $O A$ and its pressure $A A$. Suppose this substance is contained in a cylinder, and that the volume is increased by allowing the piston to rise. Imagine further that the cylinder is in such a position that no conduction of heat can take place. No heat is allowed to enter or leave the substance, while its volume increases to $O B$. Its path may be represented by the line $A B$, which is known as an adiabatic curve. During this process, as the substance has done external work represented by the area $A A B B$ on the diagram and no heat has entered it, its temperature must have fallen. Now remove the cylinder from its non-conducting position, place it in contact with a body at its present temperature, and compress the substance until its volume is $O C$. Its condition is now represented by the point C . Through this operation its temperature has been kept constant; hence $B C$ is called an isothermal curve. Work, represented by $C B B C$, has been done on the substance, and so heat must have been given out to the body, called the condenser, with which it has been in contact. Again, place the substance in its non-conducting position and force in the piston. The varying condition of the substance is shown by another adiabatic curve, $C D$. Work, $D C C D$, is done on the substance; no

heat can leave it and so its temperature rises. Continue this process till the temperature is the same as at the beginning of the cycle and the point reached is D. Now put the cylinder in communication with the source of heat, keep its temperature constant and let it expand isothermally till it reaches A, its starting-point. It does work, $D A a d$, and takes up heat from the source. Summing up the results of these four operations, we find a balance of work done by the substance represented by the area $D A B C$, while an amount of heat, H , has been taken from the source at a temperature T , a quantity, h , having been given up to the condenser at a lower temperature, t . Carnot's first belief was that H and h were equal, but this is disproved by the dynamical theory of heat. In reality the work $D A B C$ is the exact equivalent of $H - h$. This whole cycle of operations is reversible. We can cause the substance to undergo exactly the reverse operations—take in heat h at t , and give out H at T ; while work equal to $D A B C$ is done on the body. A reversible engine is one in which the working substance can be made to go through a reversible cycle—to pass into its initial or final state alternately, and Carnot proved that a reversible engine must have the highest possible efficiency, efficiency being defined as the ratio $\frac{W}{H}$, where W is the work done by the engine in one cycle, and H as before is the heat received by the substance at the higher temperature. The efficiency must therefore depend only on T and t and be independent of the substance used. Since $\frac{W}{H}$

is the same as $\frac{H-h}{H}$, we see that in the consideration of efficiency we are dealing with a connection between the quantities of heat H , h , and the temperature T , t . Upon this connection Lord Kelvin in 1848 based a scale of absolute temperature. An absolute zero was determined, independent of the nature of the working substance. This absolute zero of the thermodynamic scale is practically the same as that of a thermometer based upon the behaviour of a perfect gas.

The second law of thermodynamics may be expressed mathematically as an equation between the heat and entropy of a substance. For further information on entropy and more extensive considerations of the deductions arrived at in thermodynamics, the reader is referred to such books as Clerk Maxwell's *Theory of Heat*, a larger work by Preston, and similar literature.

Thermo-Electricity. [ELECTRICITY.]

Thermometer, an instrument for measuring variations of temperature. The volume of a given quantity of air or other gas increases uniformly as its temperature rises, provided its pressure remains constant, and this expansion is made use of in the construction of the air thermometer. A glass tube of small bore terminates at one end in a glass bulb, and in this tube is an index consisting of a drop of mercury. If the air in the bulb is brought to the temperature which is to be measured, it will expand or contract, as the case may be, and its change in

volume will be indicated by the motion of the index; or, the tube being vertical, with the bulb at the upper end, the free end of the tube may dip under the surface of liquid, which will be forced up the tube by atmospheric pressure to a greater or less extent as the temperature of the enclosed air is varied. Owing to the large coefficient of the expansion of gases, air thermometers may be made very sensitive, but it is necessary always to take account of any variation of pressure. For most purposes a mercury thermometer is more convenient. Here again a capillary tube has a bulb at one end and the bulb and part of the tube are filled with mercury. The mercury is carefully boiled in the tube, so that all air may be carried away by the mercury-vapour, and the upper end is then hermetically sealed. Coloured alcohol is sometimes substituted for mercury, but is in general less satisfactory. Thermometers may be graduated either by comparison with a standard instrument, or by the following method:—The instrument is surrounded by melting ice, which has a fixed temperature, and a mark is made on the tube at the point at which the mercury comes to rest—this is freezing-point, 0° on the Centigrade and Réaumur scales, 32° on the Fahrenheit. It is then immersed in the steam from water boiling at the normal atmospheric pressure, which again is at a fixed temperature, and a second mark is made—this is boiling-point, 100° C., 80° R., and 212° F. The interval between these marks is then divided into 100, 80, or 180 divisions, according to which scale is adopted, and the graduation is continued above and below as far as necessary. These graduations are preferably etched on the glass stem, but may be marked upon a paper, or other scale attached thereto. A thermometer is more sensitive as the size of the bulb is greater and the bore of the tube smaller; and in an instrument required to indicate quickly the bulb must be made as small as will give the requisite sensitiveness, and the glass of the bulb should be thin. The glass undergoes a molecular change in course of time, whereby the volume of the bulb is diminished and the zero displaced, and a thermometer should, therefore, not be graduated until it has been made for some considerable time. In registering thermometers a small index is placed in the tube, and is pushed along by the mercury; when the liquid sinks this index is left, and indicates the maximum or minimum temperature which has occurred since the index was set. The indices may be made of iron, in order that they may be replaced with the aid of a small magnet. Metallic thermometers are occasionally used, and consist of a strip composed of two ribands of metal fastened together. These metals are selected so that their coefficients of expansion are as different as possible, and by their differential expansion and contraction the strip bends with changes of temperature. In Immisch's thermometer the tube of a small Bourdon pressure-gauge is filled with ether. The attractions of pressure and volume with change of temperature thus move a pointer over a scale.

To convert Centigrade or Réaumur degrees into Fahrenheit degrees, one or other of the following

formulæ may be employed (F being Fahrenheit, C Centigrade, and R Réaumur):—

$$F = \frac{9}{5}C + 32, \text{ or } = \frac{9}{4}R + 32, \text{ or } = C + R + 32$$

$$C = \frac{5(F - 32)}{9}$$

$$R = \frac{4(F - 32)}{9}$$

Thermopylæ, a pass of ancient Greece, between Mount Œta and a morass upon the Mallac Gulf (Gulf of Lamia), leading from Thessaly into Attica where in 480 B.C. Leonidas with 300 Spartans heroically disputed the passage of the Persian army, till treachery led to their being attacked in the rear and utterly destroyed. The pass was forced in a similar manner by Brennus and his Gauls in 279 B.C. The hot springs in the vicinity are supposed to have originated the name, which means literally "hot gates."

Theseus, the legendary hero of the Ionians, was the son of Œgeus, King of Athens, and Æthra, daughter of Pittheus, King of Troezen. Among his exploits are enumerated the destruction of Procrustes and other robbers and the Marathonian bull, and especially the killing of the Minotaur. Theseus became King of Attica and founded the Panathenæic and Isthmian games. He carried off Hippolyte, Queen of the Amazons, and assisted Pirithous to expel the Centaurs; besides descending to Hades, where he attempted the abduction of Persephone and, being captured, was freed by Hercules. Though the eighth day of every month was sacred to him, the great yearly festival in his honour was held on the day corresponding to our October 21st.

Thespis, the founder of the theatre and the inventor of Greek tragedy (though, in a higher sense, this honour probably must be assigned to Æschylus). He is supposed to have been a native of Icaria in Attica and to have flourished about 536 B.C. He was the trainer and leader of choruses and the improvement he effected was to bring on to the scene a second actor to sustain dialogue with the leader. The practice hitherto prevailing required the leader to address the chorus and to be answered by them. Thus, at all events, Thespis must be regarded as the introducer of dialogue for dramatic purposes.

Thessalonians, EPISTLES TO THE. The church of Thessalonica, an important commercial city of Macedonia, was founded by St. Paul in A.D. 52 or 53 during his second missionary journey. It was composed mainly of converted pagans and "devout Greeks," the number of Jews being extremely small. Compelled by Jewish hostility to leave the city, he proceeded through Berea to Athens and thence to Corinth, where he remained a year and a half. According to the subscription in the Codex Alexandrinus and other manuscripts, the letters were written from Athens, but internal evidence shows that their composition

took place later, during the apostle's sojourn in Corinth. The First Epistle, the authenticity of which is firmly established, offers general advice and encouragement to the church, alluding, among other matters, to their disappointment at not witnessing the advent of the Lord. The main theme of the Second Epistle is the excitement caused by the expectation that Christ would shortly come, owing to a spurious letter purporting to be written by St. Paul. The apostle brings forward arguments to show that the second advent must be deferred, and in so doing uses language which appears to some critics to be inconsistent with that of the first. For this reason, among others, the genuineness of the Second Epistle has been disputed.

Thessalonica. [SALONICA.]

Thessaly, the largest division of ancient Greece, lay to the south of Macedonia, and to the east of Epirus, from which it was separated by the Pindus range. Mountains, including Olympus, shut in the plain on the north. Mount Othrys separated it from the states on the south, while in the east were the famous heights of Pelion and Ossa. The beautiful Vale of Tempe, traversed by the Peneus (modern Salamoria), lay between Olympus and Ossa. The country was very fertile and was noted for its breed of horses. Its origin was said to be Pelasgic, but a later settlement was made by Dorian emigrants who subdued the original inhabitants. After a time of prosperity its liberties were curtailed by a succession of despotic rulers. It was subdued by Philip of Macedonia and passed later into the possession of the Romans. At a later period Venice held it and then it passed to the Turks. The Greek Revolution of 1821-9 freed the southern districts from the Turk and the remainder was ceded (under pressure from the Powers) on June 14th, 1881. Thessaly comprises the three nomarchies, or provinces, of Arta (395 square miles, with a pop. of 40,000), Trikkala (2,200 square miles, pop. 177,000) and Larissa (2,478 square miles, pop. 182,000), and has thus an area of 5,073 square miles. Pop. (estimated), 399,000.

Thetford, a town of Norfolk, England, a small portion of the borough, however, being situated in Suffolk. The counties are divided by the Little Ouse, here joined by the Thet. The principal buildings are St. Cuthbert's Church, almost wholly rebuilt in the Perpendicular style in 1852; St. Mary's (restored 1866), on the left or Suffolk side of the river, a flint edifice with stone dressings, in the Norman and Perpendicular styles; St. Peter's, a Decorated structure of cut flint, which gained it the name of the "Black Church"; the Grammar School, founded in 1556 by Sir Richard Fulmerstone; the Guildhall; the Mechanics' Institution; the Odd Fellows' Hall and the King's House, a mansion of flint and brick, once occupied by Queen Elizabeth and James I. Among several religious houses formerly standing here may be mentioned the monastery of the Holy Sepulchre and the Sacred Cross, founded by William de

Warrenne, Earl of Surrey, for canons of the Holy Cross; the Cluniac priory of St. Mary and St. Andrew, founded in 1104 by Roger Bigod; the Benedictine convent of St. George and St. Gregory, founded in 1176 by the Abbot of Bury for nuns from Ling; the Augustinian convent of St. Mary and St. John, founded by Geoffrey de Favanhes in the reign of the Conqueror; and the college of St. Mary and St. Bartholomew, founded by Gilbert de Pyckenham in the time of Edward I. The industries include brewing, malting, tanning, fellmongery, iron-founding, the making of agricultural implements, engineering, and flour-milling, besides brick and lime kilns, bone-crushing, and manufactures of chemicals and artificial manures, and papier-mâché goods. Pop. (1901), 4,613.

Thibet. [TIBET.]

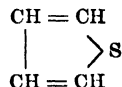
Thick-Knee, or **STONE CURLEW**, a bird belonging to the genus *Eidienemus* of the Bustard family, distinguished from the true Bustards by the bill being longer and the wings more pointed. There are about a dozen species widely distributed. The single European species, the Common Thick-knee (*E. crepitans*), visits England in summer. The male is about 17 inches long, with brown plumage, mottled with black and white.

Thierry, JACQUES NICOLAS AUGUSTIN, historian, was born at Blois in France on May 10, 1795, and, after leaving college, adopted the vocation of teacher, but abandoned the profession to become a disciple and secretary of Saint-Simon. His earliest work, an unimportant one, appeared in 1816 and, having quarrelled with his master, he joined the ranks of journalism soon afterwards. Sir Walter Scott's novels had aroused in him a great interest in history, which led to the publication of several valuable works, notably *Histoire de la Conquête de l'Angleterre par les Normands* (1825), which has become a standard work. The application necessary to complete this work cost him his eyesight. Among his other works may be mentioned *Dix Ans d'Études Historiques* (1834) and *Récits des Temps Mérovingiens* (1840). He died at Paris on May 22nd, 1856. His younger brother AMÉDÉE SIMON DOMINIQUE THIERRY (born at Blois, August 2nd, 1797; died at Paris, March 27th, 1873) was the author of an excellent *Histoire des Gaulois* (1828).

Thiers, MARIE JOSEPH LOUIS ADOLPHE, statesman and historian, was born of humble parents at Marseilles, France, on April 14th, 1797, and was educated at the lycée of his birthplace. He became an advocate in 1820 and in 1821, with his friend Mignet, the historian, went to Paris to seek his fortune. After a struggle, he joined the press, and became known in political circles as a clear writer and hard thinker. He published in 1827 his notable *Histoire de la Révolution Française*, which at once gave him an eminent rank as an author. In conjunction with others he founded the *National* in 1830, a successful newspaper, and, after the Revolution and accession of Louis Philippe, he was made a State Councillor and member of the Chamber of Deputies. Between 1832 and 1834 he

held various posts in the Ministry and, in 1836, after a temporary retirement, became its head for a short period. In 1834 he had been received into the Academy. In 1840 he was President of the Council and Minister for Foreign Affairs, and during his short tenure of office for six months had difficulties with Great Britain and Germany. Withdrawing from public life, he occupied himself with his *Histoire du Consulat et de l'Empire*, which cost him years of labour, and was finally completed in 1862. For many years he took no part in public politics, but he was elected Deputy for one of the Paris constituencies in 1863, and was amongst those who strongly denounced the Franco-German War of 1870. During the war he became head of the Provisional Government, and in August, 1871, was elected "Chef du pouvoir exécutif," that is virtually, in all but name, President of the French Republic, which post he held until 1873. During the extremely trying period immediately following the war he deserved well of his country, for he, more than any other man, proved to be the true "liberator of the territory." His strenuous life, however, had told on him and he died suddenly at St. Germain-en-Laye on September 3rd, 1877. He left a manifesto urging upon his fellow-countrymen the necessity for standing by the Republic, which he declared to be the only form of government for a sovereign people.

Thiophen (C_4H_4S), a liquid compound occurring in coal-tar, in which it was discovered by Victor Meyer in 1883. It may also be readily prepared synthetically, the methods of preparation as well as the reactions of the compound indicating the constitution—



It is a colourless liquid, which boils at 84° C. and solidifies at low temperatures. It possesses an odour which closely resembles that of benzene, to which latter compound also thiophen exhibits a most remarkable similarity. By replacement of the H atoms in the compound by other elements or radicals a very large number of thiophen derivatives are obtained. These compounds are recognisable by the formation of a dark blue colour when mixed with sulphuric acid and isatin, a test very characteristic of the thiophen group.

Thiosulphates are the salts of a thiosulphuric acid ($H_2S_2O_3$). The most important, both chemically and commercially, is the sodium salt, which is commonly known as hyposulphite of soda. It is a colourless crystalline salt of the composition $Na_2S_2O_3 \cdot 5OH_2$, readily soluble in water. It is prepared by boiling a solution of sulphite of sodium with powdered sulphur and is also obtained from the waste liquors of the soda manufacture. It is used in chemistry especially as a reagent for numerous volumetric analyses. It is employed to a large extent in photography as a fixing agent, as its solution dissolves the iodide or chloride of silver. It is also employed as an antichlore, i.e.,

to remove the last traces of chlorine from materials which have been bleached by that gas.

Thirlwall, NEWELL CONNOR, historian and bishop, was born at Stepney, London, on February 11th, 1797, and educated at Charterhouse and at Trinity College, Cambridge. He is said to have known something of Latin in his third year and could read Greek at four. He had a distinguished university career and was called to the bar in 1825. Afterwards, however, he determined to enter the Church and returned to Cambridge. His translation of F. Schleiermacher's *Critical Essay on the Gospel of St. Luke*, with a masterly introduction by Thirlwall, had appeared anonymously in 1825. In 1828 he was ordained priest and in the same year translated Niebuhr's *History of Rome* in conjunction with Julius Charles Hare, contributing largely to *The Philological Museum* (of which he was one of the editors) till its cessation in 1833. His knowledge of Greek history and life was profound, and is evidenced in his admirable *History of Greece* (1835-44), which, though superseded as a whole, is invaluable in some respects. The publication of a pamphlet by him favouring the admission of Dissenters to degrees (1834) resulted in the loss of a tutorship he held at Cambridge, but Government presented him to the living of Kirby Underdale, in Yorkshire, and in 1840 he was raised to the see of St. Davids, where his extreme zeal and generosity earned him considerable popularity. His published charges are very moderate and fair-minded. He died at Bath on July 27th, 1875, and was buried in Westminster Abbey.

Thirst. The sensation of thirst is usually referred to the back of the throat, but is caused by a general condition of the body, resulting from lack of fluid. This is shown by the fact that moistening the fauces is only of temporary benefit in relieving thirst, while the injection of fluid into the blood-vessels, or its absorption from the skin or mucous membrane of the alimentary canal, permanently relieves the condition. Excessive thirst is a characteristic symptom in certain diseases, among which diabetes may be especially referred to.

Thirty-Nine Articles. [ARTICLES.]

Thirty Years' War, the name given to the religious struggle which rent Germany from 1618 to 1648, leaving her in a state of exhaustion and demoralisation from which she did not wholly recover till the first quarter of the 19th century. Its primary cause was the hostility of the Roman Catholics and the Protestants, but the contest between authority and liberty extended to the sphere of civil life, the Protestant Union of 1608 having been formed for political as well as religious purposes. The Roman Catholic states in their turn formed an association under the protection of the Emperor in 1609. The war broke out in Bohemia, where the tyrannical policy of the Emperor Matthias in matters of religion provoked a rebellion, which culminated in the choice of the Elector-Palatine, Frederick V., as king in place of Ferdinand II.

(1619). In the same year Ferdinand succeeded Matthias on the Imperial throne. The Imperial forces, which were aided by Spanish troops, eventually prevailed, though the subsequent successes of Count Mansfeld and Christian of Brunswick in the War of the Palatinate (1621-24) to some extent compensated for the failure of the Bohemians. After the accession of Christian IV. to the Protestant cause (1624) the scene of war was transferred to Lower Saxony, but the victories of Wallenstein and Tilly so completely established the ascendancy of the Imperialists that Christian gladly withdrew his support, agreeing to the terms of the Peace of Lubeck (1630). A new champion of Protestantism now appeared in the person of Gustavus Adolphus, who, at the head of a Swedish army, rapidly gained possession of Pomerania and Mecklenburg, crushed Tilly in the battle of Leipzig (September, 1631), marched triumphantly along the valleys of the Main and Rhine, inflicted a second defeat on Tilly beside the Lech (April, 1632), and entered Munich. From that town he was drawn by Wallenstein into Saxony, and, though his army was victorious at Lützen, he himself was slain in the battle (November, 1632). For some time the Protestant party was held together through the sagacity of Oxenstjerna, the Swedish Chancellor, but the disastrous defeat at Nordlingen (September, 1634) and the conclusion of peace between Austria and Saxony (May, 1635) led to the final collapse of the German alliance. The Swedes, however, were determined to retain their conquests in Germany, and opened negotiations with the French, who sent armies to operate on the Rhine and against the Spaniards in the Netherlands. Victory after victory crowned the arms of the Swedes and, although the French were at first driven back, the ultimate success of Condé and Turenne, culminating in the second battle of Nordlingen (August, 1645), completed the overthrow of the Imperial power. The war was at length brought to a close by the Peace of Westphalia in 1648.

Thistle, a popular name applied to a number of spinous herbaceous plants, mostly Compositæ. Though the ligulifloral genus *Sonchus* is known as sow-thistle, the thistles proper are almost co-extensive with the tubulifloral tribe *Cynaræ*, which is characterised by scattered leaves, usually spinous-toothed; an involucre often globose and of spinous bracts; and the flowers all tubular and generally bisexual. *Onopordum Acanthium* is known as the Scottish thistle, a title more applicable to *Carduus lanceolatus*; *Carthamus tinctorius* is sometimes called "saffron thistle"; and the globe artichoke (*Cynara Scolymus*) is practically a thistle; but most thistles belong to the genus *Carduus*, and are characterised by having several rows of long feathery hairs in the sessile pappus which constitutes "thistle-down" and which rapidly disperses these deep-rooted and troublesome weeds over agricultural land.

Thistle, ORDER OF THE, or OF ST. ANDREW, was instituted by James II. in 1687 and revived by Anne in 1703. The number of knights, originally twelve, was increased to sixteen in 1827, in addition

to the sovereign and nominated members of the Royal family. The thistle had been the national badge of Scotland since the reign of James III., and on coins of James VI. (I. of England) is accompanied by the words *Nemo me impune lacesset*, freely translated in the Scots vernacular, "Ye daurna meddle wi' me." In the motto of the Order *lacesset* has been substituted for *lacesset*. The star of the Order consists of a St. Andrew's cross, with rays emanating from between the points of the cross. In the centre of the cross is a thistle in green upon a gold field, surrounded by a circle of green with the motto in characters of gold. The collar is of thistles intermingled with sprigs of rue. The badge consists of a figure of St. Andrew of gold enamelled, with green gown and purple surcoat, bearing before him a cross enamelled white, the whole surrounded by rays of gold in the form of a glory. The mantle is of green velvet and the ribbon is green.

Thlinkeets, North American aborigines, of the south-eastern coast of Alaska from the Copper or Atna river to the Queen Charlotte Archipelago (60° to 56° N.), with one inland group, the Tagish, about the sources of the Shoshone (Snake or Lewis) river. The chief coast tribes are the Auks, Chilcats, Hoodsums, Humahs, Hanegas, Sitkas, Stahkins and Yakutats, with a total population exceeding 6,000. The Thlinkeets (*i.e.*, "men") are the Kolushans of Gallatin and the early Russian writers, so called from their characteristic dish-shaped lip ornament *kolosh* (properly *katuga*), meaning "a dish" in the language of their Aleutian neighbours. They show affinities both to the Eskimo and the Columbian Indians, and may be regarded as a sort of connecting link between these races; but the language, which is extremely harsh and uncouth, shows no resemblance to those of any of the surrounding populations, and is accordingly classed as one of the native stock-languages.

Tholuck, FRIEDRICH AUGUST GOTTFREY, theologian, was born at Breslau, Prussian Silesia, on March 30th, 1799, and was educated at the grammar school and university of his native town and Berlin University. He became professor of theology in Berlin in 1824, and in 1826 professor at Halle, which latter post he held for over fifty years. He died at Halle on June 10th, 1877. He was a man of great learning and piety, and was an acknowledged leader of Protestant thought in Germany. He wrote numerous theological works, of which the best-known were his commentaries on the Epistle to the Romans, St. John's Gospel, the Sermon on the Mount and the Epistle to the Hebrews, *Stunden christlicher Andacht* (1839), and his reply to D. F. Strauss's *Life of Jesus* (1839), besides contributions towards a history of Rationalism.

Thomas, ARTHUR GORING, composer, was born at Ratton Park, Sussex, on November 20th, 1850, and educated at Haileybury College. Abandoning his contemplated career in the Civil Service, he studied music in Paris (1873-5), at the Royal Academy of Music in London (1875-7), and under Dr. Max Bruch. His principal works were the operas

of *Esmeralda* (produced at Drury Lane, 1883) and *Nadeshda* (Drury Lane, 1885); a choral ode *The Sun Worshipers* (Norwich Festival, 1881); a cantata, *Out of the Deep*, a *Suite de Ballet* for orchestra, and several songs distinguished by melody and fine technical qualities. He died on March 20th, 1892, and a Goring Thomas scholarship was established at the Royal Academy of Music in his memory.

Thomas, CHARLES LOUIS AMBROISE, composer, was born at Metz, where his father was a professor of music, on August 5th, 1811. In 1828 he entered the Paris Conservatoire and carried off several prizes. After a tour in Italy, he settled down in France and produced many beautiful operas and other works, including *Mignon* (1866) and *Hamlet* (1868), to mention two of his most notable pieces. *Mignon* was one of the most successful operas of the 19th century, and its thousandth performance was celebrated in Paris in 1894 with great enthusiasm. In 1851 he succeeded Spontini as a member of the Académie des Beaux Arts, in 1856 was appointed Professor of Composition at the Conservatoire and, on Auber's death, became Director of that institution. He died in Paris on February 12th, 1896.

Thomas, GEORGE HENRY, general, was born in Southampton county, Virginia, United States, on July 31st, 1816, and, though beginning to study for the Law, ultimately entered the army. He served with distinction against the Indians in Florida (1841) and in the Mexican war (1846-7). On the breaking out of the Civil War in 1861 he received a command, and his prowess soon made his name a household one throughout the Federal States. He fought at Mill Springs, Perryville, Murfreesboro', Chickamauga, and in other important engagements, receiving the thanks of Congress in 1864 after his crushing defeat of General Hood. He was also appointed major-general in the United States army and, at his death in San Francisco on March 28th, 1870, was in command of the military division of the Pacific.

Thomas, SIDNEY GILCHRIST, metallurgist, was born at Canonbury, London, on April 16th, 1850, and educated at Dulwich College. Though he gained a living by his clerkship first (1867) at Marlborough Street Police Court and afterwards (1868) at the Thames Police Court, he had a strong bent for applied science, to which he devoted his leisure time. Learning in 1870 that fortune awaited the man who should eliminate phosphorus from pig-iron in the Bessemer converter, he set himself to secure this fortune and, despite limited means and imperfect appliances, was enabled, with the assistance of his cousin Percy Gilchrist (to whom he had communicated his theory), to take out his first patent for the dephosphorisation of pig-iron in 1877. His process, which became known as the Thomas-Gilchrist, was speedily adopted by the ironmasters of the world and Thomas won his fortune. He did not live long to enjoy it, however, dying in Paris on February 1st, 1885. His process consisted in substituting for the silicious lining of the converter a basic lining of magnesia or mag-

nesian limestone, which, combining with the phosphoric acid formed by the oxidising of the phosphorus, prevented the phosphorus from re-entering the metal. It was deposited instead in the basic slag, which itself thus became transformed into a substance of commercial value.

Thomasius, CHRISTIAN, jurist, was born at Leipzig, Saxony, on January 1st, 1655. Educated at first by his father, in 1675 he went to Frankfort-on-Oder to study philosophy and law. Graduating in 1679 as doctor, he became an advocate, and was appointed professor in Leipzig University, where his innovation of reading his lectures in the vulgar tongue caused a sensation. His ability and knowledge were great, but he made many enemies, and was obliged to seek refuge in Berlin. He was finally Professor of Jurisprudence at Halle, and exercised considerable influence on the legislation of his day. He was one of the founders of the University of Halle (1694) and died on September 23rd, 1728.

Thompson, ELIZABETH. [BUTLER.]

Thompson, SILVANUS PHILLIPS, physicist, was born at York, England, on June 19th, 1851, and educated at Bootham School in York, Flounders' Institute in Pontefract, and the Royal School of Mines, London. From 1876 to 1885 he held the chair of Experimental Physics in University College, Bristol, whence he was transferred to the City and Guilds of London Technical College in Finsbury, of which he became Principal and Professor of Physics in 1885. He has carried out fruitful research work in electricity and, besides treatises on dynamo-electric machinery and the electromagnet, has written for the "Century Science" series a brilliant book on *Michael Faraday* (1898) and a learned paper on "Petrus Peregrinus de Maricourt," read before the British Academy on November 28th, 1906. He is an accomplished linguist and, as a water-colour painter, has exhibited at the Alpine Club admired pictures of snow peaks and glaciers. He is F.R.S. and Past President of the Physical Society, the Institution of Electrical Engineers, the Röntgen Society and the Optical Society.

Thoms, WILLIAM JOHN, antiquary, was born at Westminster on November 16th, 1803, and entered the secretary's office in Chelsea Hospital. In 1828 he published a *Collection of Early Prose Romances* and followed it up by various other useful and interesting books, such as *The Book of the Court* (1838), *Caxton's Reynard the Fox* (1844), and *Human Longevity* (1873), the last-named being an argument that the number of well-authenticated cases of centenarians was much smaller than was generally imagined. He is best remembered, perhaps, as one of the founders of *Notes and Queries*, which was founded in 1849 and of which he was the editor till 1872. In 1845 he was appointed a clerk of the House of Lords and in 1863 deputy librarian of the House. He died in London on August 15th, 1885.

Thomson, JAMES, poet, was born at Ednam, in Roxburghshire, of which his father was minister, on September 7th, 1700. He was educated at

Jedburgh and Edinburgh University, which he attended with a view to holy orders. This prospect, however, growing uncongenial, he abandoned the Church for Letters and went to London in 1725. In the following year he published his first poem, *Winter*, which gave him an assured reputation and three guineas' profit. In 1727 *Summer* was published, and in 1728 *Spring*, a complete edition of *The Seasons* appearing in 1730, the poem on *Autumn* being then included. In the same year was produced at Drury Lane his play of *Sophonisba*, the promised success of which is said to have been cut short by the bathos of one line—"O Sophonisba, Sophonisba, O!" The wags burlesqued this with "O Jemmy Thomson, Jemmy Thomson, O!" and the piece died. He now obtained a travelling tutorship and in this capacity journeyed over Europe. After his return he wrote his poem on *Liberty*, which was coldly received on its publication in 1735. In this year Lord Chancery Talbot, to whose son he had acted as tutor, appointed Thomson Secretary of Briefs and the poet moved to Richmond in Surrey. Talbot's death in 1737, however, terminated the secretaryship and Thomson was reduced to straitened circumstances, James Quin, the actor, generously assisting him with a payment of £100. In 1738 *Agamemnon* was produced with applause and brought a pension of £100 a year from the Prince of Wales. His play of *Edward and Eleonora*, forbidden to be acted by the censor, was published in 1739. In 1740 his *Masque of Alfred* was produced at beautiful Cliveden on the Thames and is ever memorable for its immortal song of "Rule Britannia," which Dr. Arne set to felicitous music. In 1744 his wants were more than met by his appointment to the sinecure post of Surveyor-in-General of the Leeward Islands. His tragedy of *Tancred and Sigismunda* met with a success of cordial esteem at Drury Lane in 1745 and, three years later, was published his much admired poem of *The Castle of Indolence*. He also lost his pension at the same time. A few months later he caught a chill and died at Richmond on August 27th, 1748. As William Bayne, his best biographer and critic, pointed out in his charming book in the *Famous Scots* series, modern English poetry owed its return to Nature in an exceptional degree to James Thomson, who, on the one hand, worshipped her sincerely and intelligently and, on the other, interpreted her sympathetically and spiritually.

Thomson, JAMES, poet, was born at Port Glasgow, Renfrewshire, Scotland, on November 23rd, 1834, and, losing both parents at an early age, became an inmate of the Royal Caledonian Asylum in London. He managed to educate himself sufficiently to obtain employment as an army schoolmaster, and served in Ireland (where his friendship with Charles Bradlaugh began) and elsewhere in that capacity. He left the army in 1862 and found work as a clerk and journalist. In 1880 his powerful poem *The City of Dreadful Night* (which had already attracted particular attention while it was being published in the *National Reformer* a few years before), appeared in book

form and was followed by *Vane's Story* (1881) and other works. His unhappy life came to an end in University College Hospital, London, on June 3rd, 1882. The pessimism of his character is strongly revealed in his poetry.

Thomson, SIR WILLIAM, LORD KELVIN, natural philosopher, was born in Belfast, Ireland, on June 26th, 1824, and educated at Glasgow University and Peterhouse, Cambridge. In 1845



SIR W. THOMSON, LORD KELVIN.

(Photo : Russell & Sons.)

he was Second Wrangler and 1st Smith's Prize-man and was also elected Fellow of his college. Even in boyhood he had remarkable aptitude for natural science and some valuable papers, written before he reached his majority, led to his being given the professorship of natural philosophy at Glasgow in 1846. This chair he held till 1899, his jubilee being celebrated in June 1896 with great éclat. As a thinker and worker in the laboratory his name will always be associated with his contributions to Thermodynamics, including his proposition of the absolute scale of temperature and his statement of the principle of the Dissipation of Energy. His work in the field of submarine telegraphy was of incalculable value and he was the electrician of the Atlantic (1857, 1865) and most of the other great sea cables. In this connection he invented the mirror galvanometer and siphon recorder, his electrometer and many other electrical measuring instruments, besides his mariner's compass, sounding apparatus, tide gauge, tidal harmonic analyser and tide predictor. These represent his principal inventions between 1865 and 1897 and were concurrent with his heavy class-work at Glasgow University (for which he wrote, in conjunction with Peter Guthrie Tait, a *Treatise on Natural Philosophy*) and scores of papers to the learned societies. He was knighted in 1866 in recognition of his services to Transatlantic tele-

graphy and was raised to the peerage as Baron Kelvin in 1892. In 1896 he was made Grand Cross of the Royal Victorian Order and is an original member of the Order of Merit. From 1890 to 1895 he was President of the Royal Society, in 1904 was appointed Chancellor of Glasgow University and holds the highest distinctions that can be conferred on a foreigner by the Great Powers.

Thor, or **THUNDER**, was the most popular and in some respects the chief of the Scandinavian gods. In the Northern mythology he is described as the son of Odin and as the defender of Asgard and Midgard against the Jotuns. His palace was the largest in the world, and his terrible hammer is a familiar figure in poetry. His force is represented as doubled when he puts on his wonderful belt of strength. We keep a memory of him in Thursday and in many place names.

Thoracica, one of the four orders of Cirripedia, including those in which the body is protected by a series of calcareous plates. It is the only order that has known fossil representatives. It includes three families:—The Acorn-shells or Balanidae, in which the shell consists of from four to eight valves or compartments; the oldest-known form is the Protobalanus of the Devonian rocks of North America, while Balanus, the genus so common on rocks between tide-lines on the British coast, dates from the Cretaceous. The second family, or Verrucidae, is less important; the shell somewhat resembles that of the Acorn-shells, but it has only six valves. The type-genus Verruca is known in the Chalk and still lives. The third family, or Lepadidae, includes the Barnacles; it is the best-known living family, and dates back the farthest, as Plumulites (or Turriculus), a fossil from the Wenlock Limestone of Dudley and beds of the same age in Bohemia, is referred to it. The living genus Scalpellum occurs also in the Chalk, while Pollicipes ranges from the Rhætic period to the present.

Thoracic Duct. [LYMPH.]

Thoracostraca, or **PODOPHTHALMATA**, a subclass of Crustacea, including those in which the eyes are carried at the extremities of flexible stalk-like appendages. The body is protected in front by a carapace or shield, while the animal consists of twenty segments constructed fundamentally on the same plan, though greatly modified to serve different purposes. The subclass includes four orders:—(1) Cumacea, a group of small forms, not well known popularly and having no fossil representative; (2) the Schizopoda, including the living Opossum Shrimps (Mysis), and probably the Carboniferous fossils Paleocaris and Gampsonyx; (3) the Stomatopoda or Locust shrimps, with Diplostylus from the Coal Measures, Scudula from the German Lithographic Stone of Solnhofen, and the many species of the type-genus Squilla as fossil representatives; and (4) the Decapoda, the best-known order, including the Crabs, Lobsters, and Hermit Crabs.

Thoreau, HENRY DAVID, author and naturalist, was born at Concord, Massachusetts, United States,

on July 12th, 1817. He came of a family that had once belonged to St. Helier in the island of Jersey. He went to school in Boston and then to Harvard University, where he graduated in 1837. For three years he acted as a schoolmaster, but his strong opposition to the slave trade and constant efforts in favour of abolition brought him into conflict with the advocates of slavery, and he was obliged to give up his calling. He had from an early age been deeply interested in animal and vegetable life, and withdrew in 1845 into solitude in Walden Wood, where he had built a small retreat and where, for two years and a half he pursued his natural history studies. The result is seen in his exquisite book, *Walden: or, Life in the Woods* (1854), which became immensely popular. He settled in Concord finally, where he followed the trade of a pencil-maker and where he died on May 6th, 1862. He wrote for many periodicals, and published *A Week on the Concord and Merrimac Rivers* (1849) and other works. If he dwelt, for a period, far from the madding crowd, this was due to his love of Nature and of commune with her and in no sense to misanthropy.

Thorium (chemical symbol, Th; atomic weight, 116) was discovered by Berzelius in 1829 in a rare mineral, thorite. It is a grey metal, of specific gravity about 7.6, which burns brightly below a red heat. It forms salts corresponding to an oxide ThO, but none is of chemical or practical importance.

Thorn, a fortified town of the province of West Prussia, in Prussia, on the right bank of the Vistula (here crossed by a viaduct), 28 miles S.E. of Bromberg. It was founded by the Teutonic League in 1231, and subsequently became a Hanse town. It passed to Poland in 1454 and to Prussia in 1793. It contains a town hall, some interesting old buildings and a statue of Copernicus, who was born here in 1473. A conference was held here in 1645 to try to reconcile the Church and the Reformers. The manufactures include machinery, tobacco, soap and gingerbread (a speciality), besides iron-founding. Pop. (1900), 29,626.

Thorn, a term preferably confined to the rigid woody sharp-pointed modifications of leaf-structures, similar stem-structures being termed spines, and mere hypodermal emergences which resemble them, prickles. In the teasels, thistles, holly and Mahonia we have surface or marginal thorns on the blade of the leaf; in Robinia and Acacia the stipules are thorns; in cactuses and some barberries the entire leaf is reduced to a thorn. Some writers use the terms thorn and spine in a manner the converse of the above.

Thorn-Apple (*Datura Stramonium*), the best-known species of its genus, probably a native of the Caspian region, but commonly occurring on waste ground in England, is a coarse annual solanaceous plant, branching cymosely; with large, terminal, funnel-shaped, pleated, white flowers, followed by four-chambered, four-valved spinous capsules, from which the plant gets its English

name. The leaves and seeds contain the poisonous narcotic alkaloid daturine, $C_{17}H_{23}NO_3$, an isomer of atropine, which is valuable as a sedative in neuralgia, epilepsy and other complaints. The leaves are smoked as cigars in cases of asthma. It has been conjectured that this drug was used by the priests of Apollo at Delphi to produce frenzy.

Thornback (*Raja clavata*), a common British



THORNBACK.

ray. Its popular name refers to the bony spines on the upper surface, more abundant in the female than the male and extending down the tail in a median line. It is an article of diet and is frequently salted.

Thorough-Bass, a system of harmonic composition in which numerals are used to indicate the intervals between each tone of the given bass and the constituent tones of the chords to which it belongs.

Thorwaldsen, BERTEL (ALBERT), sculptor, was born at Copenhagen on November 19th, 1770. His father was an Iclander who practised wood-carving in the Danish capital. As a boy Bertel assisted his father, but, having artistic leanings, he was allowed to enter the Art Academy of his native town and there carried off many honours. In 1797 he went to Rome, and worked quietly there, unnoticed for some time, till Canova discovered him and his kindly patronage made him famous. He returned to Copenhagen in 1819 and received a splendid welcome. From 1820 till 1837 he again lived in Rome, and produced his statues of "Mercury" and "The Dying Lion," his equestrian figure of the Emperor Alexander, and the great bas-relief "The Triumph of Alexander." He modelled the colossal statues of Jesus and the Apostles, now in the Fruenkirche in Copenhagen. He died suddenly in Copenhagen theatre on March 24th, 1844.

Thou, JACQUES AUGUSTE DE, historian, was born in Paris on October 8th, 1553. He first studied law and afterwards took holy orders, obtaining a prebend at Notre Dame. His knowledge of law was considerable and, after travelling in Italy, he was appointed in 1578 ecclesiastical councillor in Parliament, subsequently receiving other appointments. About 1588 he renounced his orders and became a Councillor of State, next serving five years under Henri of Navarre. He became Keeper of the Royal Library and as magistrate warmly supported the Edict of Nantes. He died in Paris on May 7th, 1617, it is said, from vexation at not being made first President of the

Parliament after Henri IV.'s death. His chief work is his admirable contemporary history, *Historia sui Temporis* (1604-20), which gave offence to the Vatican by its outspokenness.

Thrace, an ancient district the name of which was somewhat vague in import. It was generally taken to include all the country lying on the west of the Euxine (or Black Sea), between the Ister (the Danube) and the Ægean Sea. Under the Roman rule part became Macedonian and part Mœsian (Bulgarian), and the name Thrace was confined to the territory from Mount Hæmus (the Balkans) to the Propontis, and from the Euxine to Nestus (the Kara-su). It was a land of hills and forests, contained Mount Rhodope, and was watered by the Hebrus (the Maritza). After many vicissitudes, it passed into the hands of the Turks, and part of it is now Eastern Roumelia.

Thraco-Hellenian, a branch of the Aryan linguistic family, including the Albanian, Attic, Byzantine, and Modern Greek languages.

Thrashing. The thrashing-machine was invented by Andrew Meikle (1719-1811), a mill-wright settled at Houston Mill, near Dunbar, about 1786. Various improvements have since been introduced, but in all essential features it remains the same. In Meikle's machine the sheaves are pushed forwards with the ears foremost from a slanting feeding-board, and caught between two revolving rollers with parallel grooves. As they emerge from this position they come into contact with a cylinder or "drum" furnished with four projecting ribs parallel to its axle, called "beaters," which strike their heads so as to separate the grain from the straw. After being carried together over the drum, the loose grain and chaff remaining in the straw are removed by two successive "shakers" or "rakes" supplied with several spikes, the whole of the grain passing through wirework below, and thence to a winnowing-machine, where it is separated from the chaff.

Thread-Worms, a name applied to the small, cylindrical worms which form the class of Nematoda. The Common Thread-worm (*Oxyurus vermicularis*) is a Nematode worm, and is one of the most common of the parasites which infest the human intestine. The female is rather less than $\frac{1}{2}$ an inch long, the male about half this size; the eggs are oval bodies of about $\frac{1}{100}$ of an inch in length in the long diameter. Thread-worms are more common in children than in adults: they inhabit the lower bowel, and usually give rise to itching about the anus. The fact of their presence is readily verified by the detection of the worms themselves or of their ova in the fæces. The local injection of quassia, combined, if necessary, with the use of parasiticide ointments, is usually effectual in destroying the worms.

Thresher. [FOX-SHARK.]

Thring, EDWARD, schoolmaster, was born at Alford, in Somerset, England, on November 29th, 1821, and was educated at Ilminster Grammar

School, Eton and King's College, Cambridge. He was ordained in 1846 and in 1853 was appointed headmaster of Uppingham School, the success and reputation of which are due to his zeal, enterprise and enlightened views on education. He found the School with 25 boys and two masters, and he raised it to 320 (the number to which he restricted it, for he thought most English public schools far too unwieldy) and 30 masters. He attached special importance to classical and modern languages, manual training and music. His principal works were *Thoughts on Life Science* (1869), *Education and School* (1864) and *The Theory and Practice of Teaching* (1883), besides several textbooks and *School Songs* (1858), *Borth Lyrics* (1881) and *Poems and Translations* (1887). He was the founder of the Headmasters' Conference (1869), and his was the first public school to establish a mission to the poor in London (North Woolwich, 1869). He died at Uppingham, Rutlandshire, on October 22nd, 1887.

Throat, DISEASES OF THE. Sore-throat—that is to say, inflammation affecting the fauces, tonsils, and palate—is a malady of common occurrence. Simple catarrh may involve the throat, and may occur from time to time, constituting the common condition sometimes known as relaxed sore-throat. This condition is apt to be recurrent and those thus threatened would find the throat strengthened by the use every morning of a simple gargle containing a pinch of common salt, of borax and of powdered alum in a cup of cold water. Severer forms of relaxed sore-throat will require stronger kinds of gargle. Being sometimes of stomachic origin, it will be well also to resort to a simple wholesome aperient. Hospital sore-throat is a form of disease affecting those who are exposed to the atmosphere of a hospital. When the tonsils are mainly involved in the inflammatory condition, the disease is known as tonsillitis. The term quinsy is also applied to acute inflammation affecting the structures at the back of the throat. Soreness of the throat is an important symptom in such diseases as scarlet fever and syphilis, and it may occur in association with rheumatism, gout, etc. The throat is, of course, one of the chief situations apt to be involved in the local mischief in diphtheria. Affections of the larynx are sometimes loosely spoken of as forms of throat disease.

Thrombosis. [PHLEBITIS.]

Thrush, a bird belonging to the Passerine family Turdida, and its type-genus *Turdus*, with numerous species, very widely distributed. Some naturalists restrict the genus to those forms in which the plumage is spotted on the breast in both sexes; in the young these markings extend to the back, but are lost after the first moult. The Song-thrush, or Mavis (*T. musicus*), is common all over Great Britain. The length of the adult male is about nine inches, the female is a little smaller. The plumage is olive-brown above and the chest and sides are golden buff, with triangular patches of black. From its power of song it is a favourite cage-bird. The Missel-thrush, or Storm-cuckoo (*T.*

viscivorus), is somewhat larger. [BLACKBIRD, FIELDFARE, REDWING, RING-OUSEL.]

Thrush, a disease characterised by the development of white patches on the mucous membrane of the mouth, throat and tongue [APHTHÆ] and believed to be due to the presence of the parasitic fungus *Oidium albicans* in the mouth, throat and gullet. Thrush is most commonly met with in early infancy and, under such conditions, is usually attributable to faulty diet and readily responds to simple remedies. A dose of castor-oil, the addition of lime-water to the milk, and the local application of mel boracis, combined with scrupulous cleanliness and care in the administration of proper food, usually prove efficacious in curing thrush in young infants. In hand-fed children it is imperative that the bottles be kept absolutely sweet and wholesome and it is a useful precaution to wipe out the baby's mouth with a clean linen rag steeped in glycerine of borax. When thrush appears in adults, as is sometimes the case towards the end of an exhausting illness and especially of phthisis, it is usually a symptom of serious significance.

Thucydides, who is generally held to be the best of Greek historians, was born near Athens in or about 471 B.C., his family being connected with noble Thracian houses and very wealthy. From Antiphon he learned rhetoric and philosophy from Anaxagoras, and was a resident of Athens during the terrible plague of 430, being one of the few who escaped. He was, according to his own account, a divisional commander in the Peloponnesian War, and in 421 was appointed to a naval command. Evidently he was an unsuccessful soldier, and his failure in that capacity led to his being banished in 423. His exile, due to his failure to relieve Amphipolis when besieged by the Lacedæmonians, lasted for twenty years, which he occupied in travelling about Greece, collecting materials for the work which has preserved his fame to our days—namely, his *History of the Peloponnesian War*, which Alexandrine scholarship has divided into eight books. This work is one of the greatest monuments of antiquity; its narrative is written in a simple, direct and impartial manner, describing the alleged causes of the war and never forsaking the subject to dwell upon minor side issues. He relates the most noteworthy events, like the Plague of Athens, in a masterly manner, and throughout the narrative are interspersed speeches by the principal characters, which, if not of their composition, are such as one might suppose them to deliver in like circumstances. An example of this is the splendid oration of Pericles over the ashes of the soldiers of Athens, which has been accepted as the finest of all Greek utterances by an orator. The involution and difficulty in the style of these are due to his following the rules of rhetoric taught by Gorgias rather than strict grammar, which, indeed, was not yet formulated. The history is arranged as a yearly chronicle of events, but stops short eight years before the proclamation of peace. The eighth book, differing somewhat in style from the rest, has been referred by some to

another hand. His own exile ended in 403, and his death is supposed to have occurred from assassination in 401 (or possibly 396), probably in Thrace, where he had settled, and where he had large estates. His great history was first printed by Aldus in 1502, and since then has often been printed and translated. The edition by Dr. Arnold (1830-5) is one of the best, while Benjamin Jowett's translation (1881) takes high rank.

Thugs (from a Sanskrit root meaning "to conceal"), the name of an Indian religious fraternity who lived on the wealth acquired through the murders they committed in the service of the goddess Kālī, the wife of Siva. They were professional assassins and roamed the country in gangs of from ten to 100 members. It was their custom to disguise themselves as merchants, and make use of any favourable opportunity to strangle or poison the travellers whom they met. The Thugs were exterminated by Captain (afterwards General Sir William Henry) Sleeman (1788-1856), acting under Lord William Bentinck, between 1828 and 1835.

Thule, an island in the Northern seas, discovered by the navigator Pytheas, who flourished about the end of the 4th century B.C. In classic times it was regarded as the remotest point of the world. Ptolemy considered that it was one of the Shetland Islands (probably Mainland), but modern geographers are disposed to think that Iceland more nearly answers to the island described by Pytheas. The Romans, almost tautologically, prefixed the adjective "Ultima" and *Ultima Thule* has acquired a figurative sense, indicating not merely some far-distant point at the world's end but also a goal attainable possibly, though not yet attained.

Thunder is the sound heard when electric discharges take place between different groups of clouds or between clouds and the earth. The clouds observed before or during a thunderstorm have received the name of nimbus; they are often extensive enough to enshroud the earth in darkness, and are characterised by the dark, heavy and leaden appearance they present. They are found at all distances from the ground; they are often many miles thick vertically and have the appearance, when seen from afar, of undergoing rapid movements as though they were boiling. To what the thunderstorm owes its origin is still undecided, although many explanations have been suggested, but water has a considerable part to play in connection with atmospheric electricity. Since sound travels comparatively slowly through air, while light is almost instantaneous, it follows that we see the flash of the electric discharge, i.e., the lightning, before we hear the sound, and the difference in the time elapsing between the two is greater the farther away is the scene of discharge. If we watch a flash of lightning, we see it as a long line of light of varied shape. We may consider it as consisting of an infinite number of points of light, i.e., as being caused by an infinite number of simultaneous small discharges. But each of these points may not be at the same distance from us; so the sound from

the more distant point will reach us later than that from the nearer. Hence the thunder will not sound as a single report to us, but will be lengthened out into a peal. When we are very near to the storm, this difference of distance produces so slight an effect that we practically hear all the little reports at the same time and the result is a loud crash. The reflection of the sound from other clouds and from the surrounding hills also modifies the intensity of the thunder and produces that curious roll which is often heard.

Thurlow, EDWARD, LORD, Lord Chancellor, was born at Bracon Ash, Norfolk, England, on December 9th, 1731. He was educated at Seckars School in Scarning, King's School at Canterbury, and Gonville and Caius College, Cambridge, but bore the character of an incorrigible boy and was removed from college without a degree in consequence of misconduct. He joined the Inner Temple in 1752 and two years later was called to the bar. He had little knowledge of law, but had a certain imposing manner which impressed people—Charles James Fox's famous gibe, "No man ever was so wise as Thurlow looks," was not far from the truth—and his rise in his profession was rapid. He entered Parliament as M.P. for Tamworth in 1765, in 1770 was Solicitor-General, became Attorney-General in the following year, and in 1778 was raised to the woolsack in return for his services to the Government. When his ambition was gratified, however, he became an extremely obnoxious person to William Pitt and strenuously opposed all his measures. Pitt procured his removal from office in 1792. His political career was thus practically ended, for both parties in the State distrusted him too thoroughly to give him place again, and he died at Brighton on September 12th, 1806, being buried on the 25th in the Temple Church, London. Reactionary in politics and undistinguished in law, he was feared for the truculence of his tongue and his *hanteur*. On occasion, however, he was not incapable of comporting himself with dignity, as when he retorted on the Duke of Grafton, who taunted him with his plebeian origin, that his advance was due to his own exertions and owed nothing to being "the accident of an accident."

Thurot, FRANÇOIS, sailor, was born at Nuits-Saint-George, in the department of Côte d'Or, France, on July 22nd, 1726. He went to sea, rendered effective service to France as a privateer, and was offered an important command in its navy, with instructions to make a descent on the coast of Great Britain or Ireland. He accepted the command and Carrickfergus in county Antrim fell into his hands for a few days in February, 1760. On his way home, however, he was met by a British squadron, and was killed in the engagement which followed.

Thurso, a seaport of Caithness, Scotland, finely situated on Thurso Bay, 20 miles N.W. of Wick. The trade of the port is conducted from Scrabster, two miles to the north. The town hall contains a museum in which are deposited the specimens, geological and botanical, collected by Robert Dick

(1811-66), the "Thurso baker" of Samuel Smiles's biography, although he was really a native of Tullibody in Clackmannanshire. The town is a popular seaside resort and has a fine promenade along the sands. The dressing of Caithness flags (quarried in the neighbourhood) for pavements is the leading industry. Thurso Castle is the seat of the Ulbster branch of the Sinclairs. Pop. (1901), 3,724.

Thylacine, a genus of marsupials belonging to Tasmania, with a single species (*Thylacinus cynocephalus*). It is about the size of a large dog, with brownish fur marked with black stripes on the back. It commits great ravages in sheepfolds, and the farmers shoot and trap it without mercy. Being restricted in range and of detestable habits, its extinction is only a matter of time.

Thyme, the fragrant genus *Thymus*, belonging to the order Labiata, with very small leaves and dense terminal heads of reddish florets. Garden Thyme (*T. vulgaris*), a native of the western Mediterranean area, has been used from an ancient period as a seasoning. In the south of France an essential oil is distilled from it, which is sold in the United Kingdom as "oil of marjoram." From this oil the stimulant and carminative stearoptene or camphor thymol, which is also valuable as an antiseptic disinfectant, can be obtained. It is, however, mainly prepared from the mericarps of the Indian umbelliferous plant *Ptychotis Ajowan*, the Ajowan, an ally of the carraway. *Thymus Serpyllum* is the wild thyme of English banks.

Thymol ($C_{10}H_{14}OH$) occurs chiefly in oil of thyme, but is also found in other vegetable sources. It may be obtained by adding caustic potash to the oil and then adding to the solution hydrochloric acid, which precipitates the thymol. It so forms colourless plate-like crystals, which melt at about 44° and boil if heated further. It possesses an odour resembling that of thyme, and is easily soluble in alcohol and ether. It is a phenol and accordingly in many respects resembles carbolic acid; by reduction it yields the hydrocarbon cymene $C_{10}H_{14}$.

Thymus Gland, a glandular body situated in the lower part of the neck. The thymus reaches its maximum development shortly after birth, and from the second year of life onwards gradually atrophies, so that in adult life it is a mere remnant of the original structure. The thymus consists of a number of follicles composed mainly of adenoid tissue. The function of the gland is not well understood, but it appears likely that it is concerned in early life in the development of red blood corpuscles. In hibernating animals the gland does not atrophy, but persists throughout life and undergoes enlargement just before each period of hibernation.

Thyroid Gland. [GOITRE, CRETINISM, MYXCEDEMA.]

Thysanura, the lowest order of Hexapoda, or True Insects, including the Springtails and Bristletails. It is particularly characterised by the

entire absence of wings and of any metamorphosis and also by the feebleness of the mouth organs, which are generally concealed within the cavity of the head. The creatures frequent obscure places, some preferring moist localities and others dryness and warmth. They feed on decaying vegetable matter.

Tibbus, a people of North Africa, who appear to represent the ancient Garamantes reduced in 19 B.C. by Cornelius Balbus Gaditanus the Younger. They occupy all the inhabitable parts of the Sahara east of the Tuareg domain, i.e., from about the 13th meridian to the Libyan desert, their chief centre being the Tibesti highlands. The Tibbus, or "Rock People," form two main divisions, the northern Teda of Tibesti, Borku and all the surrounding oases as far as Kufra, and the southern Daza of Kanem and the eastern shores of Lake Tsad. Here they are much intermingled with the Sudanese Negroes, and often present a distinctly Negroid type; but the Tedas, who represent the original stock, have a much lighter complexion and regular features like the Hamitic Tuaregs. But the language is entirely distinct from the Hamitic and shows strong affinities with the Kanuri and other Negro tongues of Central Sudan. All the Tibbus are rude, unlettered Mohammedans, fierce marauders, treacherous and fanatical; hence their domain still remains imperfectly explored.

Tiber, a river of Central Italy, rising in the Apennines, flowing in a south-easterly direction to Perugia, then southwards to Rome, and then towards the south-south-west to the Mediterranean, which it enters by two mouths. The northern of these branches is navigable and the delta enclosed by them is called Isola Sacra. In its course of 260 miles, the Tiber receives the Nera, Velino, and Aniene on the left, and the Paglia, with Chiana, on the right and is navigable for small vessels to the junction of the Nera. Owing to the mountain torrents that feed it, the Tiber is liable to inundations. In consequence of the coloured muddy sediment brought down by the rapid current, the river was called the "Yellow Tiber."

Tiberius, CLAUDIUS NERO CÆSAR, the second Roman Emperor, was the son of Tiberius Claudius Nero and Livia Drusilla and was born in Rome on November 16th, 42 B.C. His mother subsequently marrying the future Emperor Augustus, he and his brother were reared in the household of their stepfather, and were given the usual training in public affairs. Their military capacity was shown by the defeat of the Rhæti and Vindelici. In 13 B.C. Tiberius became consul, and again in 7 B.C., after having carried on a successful war with Germany. Having been forced by Augustus to divorce his wife and to marry the infamous Julia, he withdrew in disgust to Rhodes, and did not return to public life till A.D. 4, when he was proclaimed as the adopted successor of Augustus. His triumphant victories at the same period in Germany and Dalmatia increased his popularity, and in 14 he

became Emperor. He instituted various changes in the matter of election of public officers, and in other directions gradually increased the power of the monarchy, his severity in this respect causing much disquiet. Sejanus, commander of the Prætorian Guards, who had the chief direction of affairs, was more cruel than Tiberius, and carried out his instructions with ferocity, and finally Tiberius, excessively suspicious, caused him to be put to death. Retiring to Misenum, Tiberius gave himself up to debauchery and, having fallen into a trance, was suffocated as he awoke in A.D. 37. He was succeeded by Caligula. Tiberius was a great soldier, but a man of morbid and gloomy temperament; but we have to depend on very hostile witnesses for our knowledge of his rule.

Tibet, a dependency of the Chinese Empire, situated between the Kuen Lun mountains in the N. and the Himalaya in the S. and between the Pamirs in the W. and China in the E. It is a bleak, wild, mountainous tract, covering an area of 463,200 square miles, largely unexplored. The mountains rise from table-lands, which are themselves from 10,000 to 17,000 feet high. The loftiest heights are in the west and north, sloping to the south and east, and the lowest parts are where the Indus and Sanpo (or Brahmaputra) derive their source. The country is divided into seven provinces: (1) Tsaidam, containing the Koko-Nor (lake) and much marshy land; (2) Katchi, the great northern plain of steppes; (3) Nari, the Himalayan district, in which the Indus and Sanpo rise, a land of pastures and containing a sacred lake; (4) Manasarawa; (5) Little Tibet, partly belonging to Cashmere and to India; (6) Yu-Tsang, the most populous and most important province; (7) Kham, on the upper waters of the Chinese and Indo-Chinese rivers. The most populous district is the Sanpo Valley. By this river merchandise is carried down in boats made of hides stretched upon a framework of wood and, after discharging their cargo, the boats are taken to pieces and brought back by yaks. The climate is cold and dry and, after the short hot summer, the cold is extreme. In the north and west there are no trees, and the animal life consists of wild yaks, antelopes, horses, asses and goats. The southern table-lands are inhabited by a nomad pastoral people. Wheat, barley, pease, pulse and other vegetables, apricot, peach and other fruits are extensively cultivated in those districts where soil and climate are favourable. Among the minerals are gold, silver, iron, copper, zinc, mercury, borax and salt. The people are good blacksmiths and cutlers, and they take their goods to fairs and markets upon yaks. Formerly there was a brisk trade with India, but owing to Chinese ascendancy it seriously declined. China only interferes in foreign affairs and in military matters, and has two Ambans or Commissioners residing at Lhasa. The government is much in the hands of the priests, and the Dalai Lama, its head, is a kind of Pope, who acts through a regent appointed for life by the Chinese government from the principal Lamas of Tibet, and he, in turn, is assisted by five ministers. The Dalai

Lama originally received his power from Kubla Khan, who, after conquering the country, was converted to Buddhism. The prevailing religion is a species of corrupt Buddhism called Lamaism, but the older form of faith, the Bon or Shamanism, yet exists in many parts. Lhasa, the capital (20,000), was founded in 961 and the Chinese conquest took place in 1720. In 1903 an expedition was despatched to Lhasa by the British to negotiate a treaty for trading arrangements. It met with some resistance and the Dalai Lama fled, but wiser counsels ultimately prevailed and in 1906 an Anglo-Tibetan Treaty was signed at Peking by the British and Chinese representatives. It provided for the recognition by Great Britain and Tibet of China's protectorate over Tibet. Certain Tibetan markets were to be opened to Indian trade and Great Britain was to receive preference in respect of railway grants. China also undertook to pay £300,000 as indemnity for the expedition to Lhasa and Great Britain agreed not to interfere in the internal affairs of Tibet, unless others of the Powers did so. Pop. (estimated), 6,500,000, though some authorities make it considerably smaller.

Tibetans (properly *Bod-pa*, "Landsmen," "aborigines"), the indigenous inhabitants of the Tibetan plateau, and of both slopes of the Himalaya from Baltistan ("Little Tibet") eastwards to Bhutan and North Assam. They are a Mongoloid people forming a distinct branch of the Indo-Chinese division, their nearest congeners being the Burmese of the Irawadi basin. The type, which, in Burma, approaches that of the soft effeminate Hindus, is marked in the uplands by short, broad, muscular frames, low and broad forehead, black shaggy hair, small hands and feet, dark-yellow complexion, features more regular—that is, less broad and flat—than those of the Mongolians. They are a frank, kindly people, but extremely superstitious, and entirely in the hands of the Buddhist priests, who are the chief landowners and traders of the country. Polyandry is prevalent, especially in the poorer districts, where an increase of population would lead to distress and famine. The Tibetan language, which is a member of the Indo-Chinese isolating group, is spoken with considerable uniformity throughout Tibet Proper and Ladakh, and is written with a peculiar character based on the Devanagari, introduced by the Buddhist missionaries in the 7th century. It has long been cultivated and possesses a vast literature, rich especially in religious writings. As in the other Indo-Chinese languages, tones have been developed, at least in the central provinces, to compensate for loss in the current speech of letters recognised in the written language.

Tibullus, ALBIUS, Latin elegiac poet, was born possibly at Gabii, some 13 miles south-east of Rome, just previous to the great Augustan age, probably about 54 B.C., and was therefore a contemporary of Virgil and Horace. He inherited much property, but most of it was confiscated after Caesar's death, and he was left with somewhat scanty means. His friendship with Marcus Valerius Messala Corvinus, the Roman general, stood him in good stead, how-

ever, and he accompanied that soldier in several of his expeditions, afterwards settling down in his villa at Gabii and devoting himself to literature. Very little is known of his life, which was clearly uneventful, but his personal character and writings are highly praised by ancient writers. He died prematurely in or about 19 B.C. His *Elegies* are his enduring monument. They are graceful, tender and natural, and have made him one of the favourite Roman writers. The finest edition of them is that printed in Venice in 1472 along with the poems of Propertius and Catullus.

Tic Douloureux. [NEURALGIA.]

Tichborne, an estate in Hampshire, 6½ miles N.E. of Winchester, has been in the hands of the same family from Saxon times. The first baronet was created in 1626. But the name is chiefly remarkable for its association with one of the most memorable trials of modern times. Sir Alfred Joseph Doughty Tichborne died in 1866, and a claimant appeared to the title and estates in the person of one Arthur Orton, who had been born at Wapping in London in 1834, and afterwards became a butcher at Wagga Wagga in New South Wales. He professed to be Roger Charles Tichborne, who was the elder brother of Sir Alfred and had been lost at sea in 1854. The civil case was tried in 1872 in the Court of Common Pleas, and lasted for 103 days. The case for the plaintiff collapsed, chiefly owing to the searching cross-examination by Sir John Coleridge, afterwards Lord Chief Justice of England, and to the production of evidence that Roger Tichborne had tattoo marks which "the Claimant" had not, and in 1873-4 he underwent a trial for perjury, the case lasting 188 days, and resulting in a conviction, followed by a sentence to fourteen years' penal servitude. The cost of the two trials approximated to £200,000. Orton died in poverty in Marylebone, London, on April 2nd, 1898.

Ticino, or TESSIN, a canton of Switzerland, bounded on the N. by Uri, on the N.E. by Grisons, on the S.E. by Lombardy, on the S. by Lombardy, on the S.W. by Piedmont and on the N.W. by Valais. It occupies an area of 1,088 square miles. It is situated partly on the southern slope of the Alps and the St. Gothard Railway passes through it from north to south. The Lake of Lugano and part of Lago Maggiore are in this canton. In the north cattle-rearing and dairy-farming are carried on, farther south forests occur, and still farther south is a country of olive, vine, corn, figs, almonds, oranges, citrons and pomegranates. The capital is Bellinzona (3,500), but the largest town is Lugano (9,553). The river Ticino rises on the southern slopes of Mount St. Gothard, flows southwards through Lake Maggiore, then in a south-south-easterly direction through North Italy, joining the Po 42 miles below Pavia. It is navigable below Lake Maggiore for a distance of 75 miles. The making of wine and tobacco and silk-culture are the chief industries. The canton entered the Confederation in 1803. Pop. (1904), 142,789.

Tickell, THOMAS, poet, was born at Bridekirk in Cumberland in 1686 and educated at Queen's

College, Oxford. He became acquainted with Joseph Addison, through whose influence he was appointed Under-Secretary of State in 1717, and in 1724 secretary to the Lords Justices of Ireland. He died on April 23rd, 1740, at Bath, and was buried at Glasnevin in Dublin. As a poet he is chiefly remembered by his ballad of "Colin and Lucy," but he translated a portion of Homer, wrote an "Elegy on Addison," and contributed to *The Spectator*.

Ticknor, GEORGE, historian, was born in Boston, Massachusetts, on August 1st, 1791, and was educated at Dartmouth and (after he had eschewed Law for Literature) at Göttingen University. In 1817 he was appointed Professor of Modern Languages and Literature at Harvard. Becoming an authority on the subject, his *History of Spanish Literature* (1849) was received with great applause on both sides of the Atlantic. He was one of the founders of the Boston Public Library, to which he presented his Spanish library. Among other books he was the author of biographies of General Lafayette (1825) and of W. H. Prescott (1864). He died in Boston on January 26th, 1871.

Ticks, a group of Arachnida belonging to the order Acarina or Mites, and forming the family Ixodidae. The Dog Tick (*Ixodes plumbeus*), which lives attached to the hair of the dog, is a well-known representative; this lives probably on vegetable food, and is not a true parasite on the animal to which it attaches itself. Many animals called ticks belong to other groups; thus the sheep ticks are really small wingless flies.

Ticonderoga, a town of New York State, United States, near Lake Champlain and on the outlet of Lake George, 90 miles N. of Albany. The French established a fort here in 1755, but abandoned it four years later. The British spent £2,000,000 upon strengthening it, but its small garrison of 50 men—not more being thought necessary after the cession of Canada—were overpowered by the provincials in 1775. In 1777 General Burgoyne recaptured it, and it was allowed to fall into ruin after the war. The lake-steamers start from here and the falls supply water-power. Black-lead and iron are the principal productions. Pop. (1900), 5,048.

Tides. The rise and fall of the water of the sea has naturally been observed during all time, and the cause of this ebb and flow has been the subject of much discussion. It is noticed that, roughly speaking, high and low water occur twice a day on the sea-coast, or, more accurately, high tide occurs 50 minutes later each day, the time between two high or two low tides being 12 hours 25 minutes. In about a week, then, the times of high and low water are reversed, while after a fortnight they are again as they were before. It is further found that the times of high water are connected with the position of the moon—that, in fact, high water occurs at a certain, but not quite constant, time after the moon has crossed the meridian. The greatest interval elapses between high water and the moon's meridian passage, when

the moon is between her first and second quarter or between her third quarter and new moon. The least interval is a week before or after each of these. Not only does the water itself rise and fall, but there is a difference in the height of the tide on different days. The highest tide obtains when the moon is new or full, and at this time also low tide is lowest. But a week later, when the moon is in her first or third quarter, the high tide reaches a far lower point, and the sea does not recede so far at low water. The maximum high tide is known as spring tide, and the minimum as neap tide; there is often a difference of many feet between the height of the water at these two periods. Although the interval between two successive high tides is 12 hours 25 minutes, this is not equally divided into the times of rising and falling. The sea takes longer to "go out" than to "come in," and this difference is more marked at spring than at neap tides, being more noticeable again in estuaries than at places overlooking the free ocean. The tide always extends for some distance up a river; it is felt on the Thames as far as Richmond, and, but for the lock at that place, would be felt much higher; but the further up we go the later is high water observed to occur. In some cases, too, the tide rises so fast that a tremendous up-rush of water takes place, often spreading over the river banks. This is exemplified by the Severn "bore." This naturally causes a higher range of tide, and we notice that at Chepstow the spring tide reaches 50 feet, while lower down, at the mouth of the channel, it is only 18 feet.

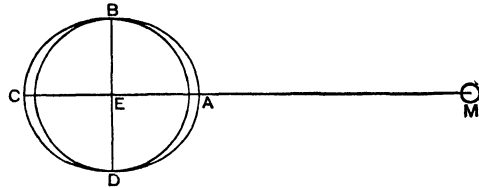
Two main theories have been propounded to account for the tides—one known as the equilibrium theory of Sir Isaac Newton, and the other as the kinetic theory of Laplace. If the earth were completely covered by water, it would be heaped up in certain places by the action of the sun and moon. The moon attracts every drop of water to herself with a force proportional to her mass and inversely proportional to the cube of her distance from the particle. If M be the moon and A B C D the earth, the water at A will be more attracted to the moon than the earth, and will therefore become heaped up, while the earth will be more attracted than the water at C; so the water there will be left behind in another heap. At the points B and D the water will sink, so that if the earth and moon were at rest the water would have shaped itself into a prolate spheroid, the long axis of which would point towards the moon. At first sight, it would appear that the effect of the travelling moon would be to attract this liquid form after her, so that as she crossed the meridian of any place she would produce high water there and also on the opposite side of the earth. High tide would thus occur twice in every 24 hours 54 minutes—i.e., twice in every lunar day. But this high tide does not occur just when the moon crosses the meridian, and this alteration is due to the fact that the water does not simply follow the moon, but is thrown into a state of oscillation. The moon causes a wave, but she travels much faster than the wave can; she causes another, beats that in turn, and so on; thus a state of oscillation is set up in the ocean. In this case,

however, there will not be the tendency for the water to be highest when the attraction to the moon is greatest. The oscillation has succeeded in inverting the apparently natural occurrence of the tides. It causes low tide to occur immediately under the moon and on the opposite side, while high tide occurs between. This is the reversal of the above figure, and we have now an oblate spheroid with the minor axis pointing to the moon. The observation of actual fact seems to show that low water does more nearly agree with the time required by the oscillation theory than with that deduced from the theory of equilibrium. But great complications arise from the introduction of land, with its varied shape, into the problem, and from our scanty knowledge of the effects of the varying depth of the sea.

The sun's influence is now to be considered. It may be roughly calculated that the influence of the moon on the tides is proportional to its mass, and inversely proportional to the cube of its distance. The influence of the sun can be expressed in the same way; but the sun's mass is about 2,700,000 times that of the moon, and his distance nearly 390 times as much. Hence his influence on the tides will be only $\frac{2,700,000}{390^3}$ times that of the moon. This is less than one-half. The sun, then, acting alone, would produce low water at noon and midnight. A combination of the two will give, as at new and full moon, the maximum effect—i.e., about $1\frac{1}{2}$ times what the moon would do alone; and at the first and third quarters the result will be a minimum, only about half the moon's single effect; for in this last case the sun and moon will be acting in opposition to each other, the moon trying to cause high water, while the sun is endeavouring to draw the tide out. This shows the origin of the spring and neap tides; only actual observation demonstrates that the two do not differ as much as the above numbers would indicate. Another inequality is due to the fact that the moon does not travel in the equator; her zenith and nadir distances are not the same for consecutive passages of the meridian on the opposite sides of the earth, and this causes the tides to be of different heights. This alteration in the heights of swelling lunar tides is known as a diurnal tide, and vanishes every fortnight, when the moon crosses the equator. For the same reason, two consecutive solar tides differ in summer and winter, when the sun is farthest from the equator, but are of equal height in spring and autumn. The earth's different distances from the sun in different parts of her orbit give rise to a further modification known as the semi-annual tide. Local peculiarities naturally produce deviations from the ordinary laws of the tides. Thus, in the Mediterranean, a sea almost entirely shut in from the ocean, the tide is hardly felt at all, except in some of the long and narrow bays. Like the bore in the Severn's estuary, the sea rises tremendously in the Bay of Bengal. Colombo, in Ceylon, experiences four tides a day; while at Papeete, in the Society Islands, high tide occurs regularly at 2 p.m. every day. The average time of retardation of high water at any place is

known as the "establishment of the port," and is equal to the time of high water when the moon is either new or full. When a large wave is started by an earthquake, it is often erroneously called a tide; and the word is often applied, too, to the rise and fall of the sea, produced by definite land and sea breezes and other meteoric phenomena. These are, however, not true tides, for they are not the result of the attraction of the sun and moon, to whose action the word should be strictly limited.

Tidal instruments are for noting and predicting the tides in different places. One form of tide-gauge consists of a float in a tank or pipe filled with water coming from the sea by an inlet below



low water. Thus the water in the pipe rises and falls with the sea. The float is supported by a wire connected to a wheel, and the motion of the float is communicated to a fine pencil, which rests against and marks a drum, the latter being caused to rotate once in twenty-four hours; a record of the tide is thus made on the drum. Sir William Thomson's (Lord Kelvin's) instrument for the prediction of tides consists of a drum, moving proportionally to mean solar time, and marked by a pencil. This pencil is connected to a number of pulleys, each pulley having a harmonic motion and corresponding to one of the lunar or solar tides, which have been found by harmonic analysis of the curves given by the tide-gauge. The pencil then produces on the drum the added effect of these different components, and this is known as a tide-curve. From the tide-curve at any place the height of the tide on any day can be predicted, a result very useful in navigation.

Tieck, LUDWIG, poet and novelist, was born at Berlin on May 31st, 1773, and studied at Halle, Göttingen, and Erlangen. His literary activity began early, chiefly resulting in romantic and mystical works. He showed a unique felicity in dramatising some of the old fairy tales and his first notable works are the *Volksmärchen* (1797) and the *Romantische Dichtungen* (1799-1800). The stories first mentioned were afterwards revised and republished in 1812-15, and are considered Tieck's best original work. But his *Franz Sternbald's Wanderungen* (1798) must always hold a high and honoured place in German literature. His translation of *Don Quixote* (1799-1801) gives him a foremost rank as a translator. His works on the old English drama, *Altenglische Theater* (1811), and on Shakespeare (1823-9) are valuable. He died in Berlin on April 28th, 1853.

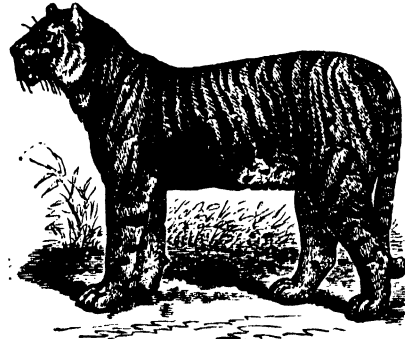
Tien-Tsin, a city and river-port of the province of Chih-li, China, on the right bank of the Peiho, 34 miles from the mouth, 70 miles S.E. of Peking, of which it is the port. There is a railway to the mouth of the Peiho, and a brisk trade is carried on with Siberia and Russia. The principal industries are distilling and carpet- and rug-making and it is a great mart for tea and salt. It has a Chinese University, an Anglo-Chinese College and a military and naval college and torpedo school in connection with the arsenal. From December to March the river is frozen, and trade is carried on by means of sledges. In 1858 Tien-Tsin was made an open port, in 1861 a British Consul was appointed, and in 1881 telegraphic communication with Shanghai was opened. It was the scene of serious fighting and riots in 1900, when the Boxers assailed the foreigners and Peking itself was besieged. Pop. (estimated), 750,000.

Tierra del Fuego ("Land of Fire"), a group of large and small islands at the southern extremity of South America, in 54° S., separated from the mainland by the Strait of Magellan, and terminating in Cape Horn. The western half of Tierra del Fuego, the chief island, belongs to Chile and the eastern half to Argentina, Staten Island to Argentina, and Navarin, Hoste, Wollaston and the rest to Chile. The coasts are abrupt and deeply indented, but most of the fiords are obstructed by bars. The country is mountainous, rising in Mount Sarmiento to a height of 7,200 feet, the snow-line being at 4,000 feet; but there are some fertile valleys. There are no rivers of importance. Sheep and cattle are raised to a considerable extent in some localities. There are some forests and certain English flowers will grow. The native animals are few, but among the animals introduced are the half-wild dogs. Birds are plentiful, but seals and sea-lions are becoming scarce. The rocks are volcanic and the level of the land is rising fast. Some gold and coal are found. There are three varieties of race: the Onas, who are tall, and the Yagans and Alakalufs, who are short. The number of the aborigines is conjectured at about 1,000.

Tiflis, capital of the government of Tiflis, Transcaucasia and of the Caucasus, on both banks of the Kur, about midway between the Black and Caspian Seas. It is connected by rail with Batum and Poti on the former sea and with Baku on the latter. It was once the capital of Georgia and as long as it preserved its Oriental character was a place of secondary importance. Under Russian rule, however, it has, since the beginning of the 19th century, developed into a commercial centre of the first rank. The churches are features of great interest and include Zion Cathedral, formerly the seat of the Catholics, or Primate of the Armenian Church. The industries comprise cotton-spinning, brewing, tanning and the manufacture of tobacco. Pop., 160,645.

Tiger (*Felis tigris*), a large Carnivore of the Cat family, confined to Asia, ranging over nearly the whole continent, from Georgia to the island of Saghalien, and from the basin of the Amoor south-

wards. Tigers, however, are absent from the great central table-lands and Ceylon; and Sumatra, Java, and Bali are the only islands of the Malay Archipelago in which they occur. Individuals vary in size; about ten feet, including the tail, may be taken as an average size of a full-grown male. The body is covered with short close hair of rufous shades, with black stripes arranged irregularly, and varying from single streaks to loops and bands. The under-surface is white, and in many individuals there is some white on the face. In the males there is a kind of ruff formed by the long hair extending from the ears round the cheeks. Tigers are principally found in grassy plains or swamps,



TIGER (*Felis tigris*).

and the striped colouring harmonises well with the reedy growth of the latter. They take readily to water and swim well; but, unlike the smaller cats, they do not take to trees, unless pressed by fear. They feed on game-birds, pigs, cattle and deer, and, when from age or injury unable to hunt their prey, become "man-eaters," frequenting the neighbourhood of villages, and lying in wait for passers-by. Sanderson says that "man-eaters" are as cowardly as they are cunning, and discriminate with wonderful sagacity between an armed man and a possible victim. The loss of human life in the East from these animals is very considerable, and tiger-hunting is a favourite sport with European sportsmen. The females produce from two to six cubs at a litter, and the young remain with the dam till their third year.

Tiger-Beetles, a family of beetles so called from their fierce habits, and from the spots and stripes with which they are ornamented. The family is known as the Cicindelidæ, of which there are about 1,000 species. The most familiar British representative is *Cicindela campestris*, which is of a green colour dotted with six white spots on the wing covers. The larvæ of these beetles live in burrows in sand, and capture ants or small insects which pass beside the mouth of the burrow.

Tiger-Bittern, a bird belonging to the South American genus *Tigrisoma*, of the Heron family, named from its variegated plumage.

Tiger-Cat, a loose name for the smaller striped or spotted cats, especially for those that have no very distinctive name. The Marbled Tiger-Cat (*Felis marmorata*) and the Viverrine Tiger-Cat (*F. viverrina*) occur in the Eastern Himalaya, Burma, Malaysia and other parts of tropical Asia, while the Long-tailed Tiger-Cat, or Oceloid Leopard (*F. macrura*)—with spotted skin and a tail 27 inches in length—and the Colocolo (*F. ferax*) are found, the former in Brazil and the latter in Central America.

Tiger-Lily (*Lilium tigrinum*), a native of China and Japan, where the scaly bulb which it possesses, like other members of the genus, is eaten as food. Its showy dull-orange-coloured flowers spotted with black (whence it derives its name) render it a favourite in many gardens.

Tillodontia, the name given by Professor O. C. Marsh to a remarkable group of fossil mammals found abundantly in the Eocene rocks of North America. In the typical genus *Tillotherium*, probably more correctly known as *Anchippodus*, the skeleton is carnivore-like, the feet are plantigrade, with five long-clawed digits to each, and the skull is bear-like; but the molar teeth are of Ungulate type and the incisors rodent-like, so that it seems to be a generalised type combining the Ungulata, Rodentia and Carnivora. Professor Cope classes these fossils with the similar *Tæniodonta* and the *Insectivora* in his order *Bunotheria*.

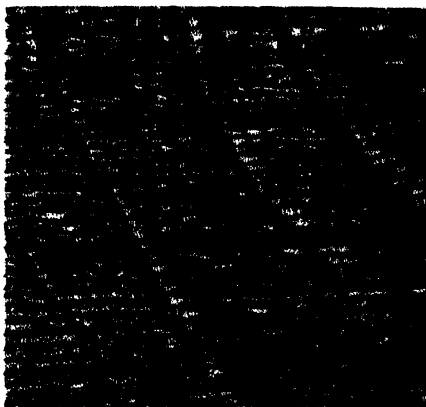
Tillotson, JOHN, Archbishop of Canterbury, was born at Old Haugh End, near Halifax, Yorkshire, in 1630. He was educated at the grammar schools of Colne and Halifax and Clare Hall, Cambridge, and was ordained early in 1661. He accepted the Act of Uniformity, and became rector of Kedington in Suffolk in 1663. He was promoted to the deanery of Canterbury in 1672 and became Archbishop of Canterbury in 1691, in succession to William Sancroft. He died in London on November 22nd, 1694. He was a notable preacher, his discourses being characterised by common sense and toleration. He was on the best of terms with his Nonconformist brethren, but a stalwart Protestant. His sermons were remarkably popular and gave him a very high place among English divines. His widow (Elizabeth French, a niece of Oliver Cromwell) received 2,500 guineas for them, and they have been frequently reprinted and are still read.

Tilly, JOHANN TSCERLAES, COUNT VON, general, was born in Brabant in February, 1559, of Catholic parents. He was intended for the priesthood but, though he always retained a fervent and even fanatical religious spirit, preferred military service, and served under Alva in the Netherlands and later in Hungary. On the outbreak of the Thirty Years' War (1618) he was made commander-in-chief of the troops of the Catholic League. He inflicted successively disastrous defeats on the Bohemians, on the Duke of Brandenburg, and on Christian IV. of Denmark, and sacked Magdeburg in 1631 in circumstances of remarkable savagery, for which he was partly responsible. In Gustavus Adolphus,

however, he met his match for generalship, was defeated at Breitenfeld in Saxony in September, 1631, and mortally wounded at the passage of the Lech in March, 1632. He died at Ingolstadt in the following month.

Tilsit, a town of East Prussia, on the left bank of the Niemen, 60 miles N.E. of Königsberg. Its leading industries are iron-founding, engineering, tanning and brewing. Its chief interest is due to the fact that, on a raft moored in the river, Napoleon and Alexander I. of Russia agreed to the terms of peace afterwards signed here on July 9th, 1807. This Treaty, constituting the Kingdom of Westphalia and the Duchy of Warsaw, was the low-water mark of Prussia's degradation. Pop. (1900), 34,540.

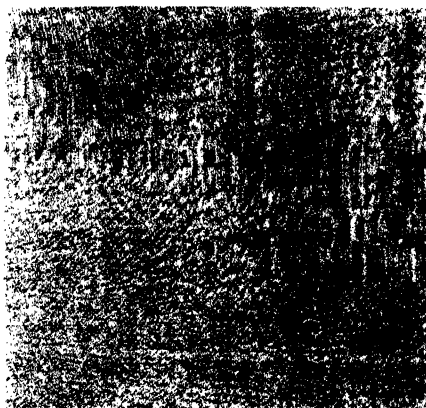
Timber, the term applied to the stems of trees after they have been sawn or otherwise handled for convenience in use. Wood has no natural substitute, neither can it be artificially produced or counterfeited. It is yielded by Nature in abundance throughout the habitable globe, and possesses such a variety of form and diversity of property that it may be employed successfully for any purpose required by man. Always of utility and frequently of remarkable beauty, timber of every kind must constantly find a certain market. At one time Great Britain was richly wooded, but so exhausting has been the call upon her resources consequent upon the increase of population and the requirements of her manufactures, that she is now compelled to look for supplies to foreign countries, and at the present time there is scarcely a country in the world that does not in some measure contribute its quota to her demands. As a general rule, the softer woods are produced in the Temperate zone, the harder and heavier in the Tropics, each wood having qualities peculiarly its own. Do we desire weight, hardness, density, tenacity, elasticity, strength, or durability, we have the timber to our hands that will fulfil what we require. The woods produced in the United Kingdom that are most generally serviceable are the Oak, Ash, Beech, Elm and Sycamore. About thirty other species grow to a commercial size, but they are not plentiful, and the purposes for which they at one time commanded favour are now filled by other species and varieties imported from other countries. For strength and durability when employed in the Temperate zone, there is no wood to equal the home-grown Oak. It knows no competitor except it be selected specimens of the American White Oak. English Oak is made the basis of all tests wherewith to compare the strength of other timbers, but unfortunately the supply is not equal to the demand and, owing to its slow growth, it cannot be recommended for profitable planting. The Ash is an admirable wood where length of fibre and elasticity are required. For bending purposes it is without a rival. It principally commends itself to the coachbuilder and wheelwright, who use it for shafts and felloes, while the toolmaker employs it for handles. Like Oak, the supply of English Ash is declining, and its place is being taken



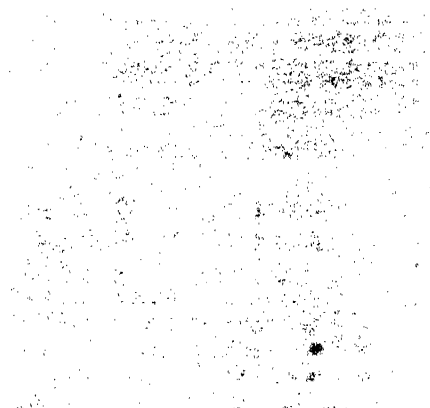
WHITE OAK.



COMMON ASH.



COMMON MAPLE.



WHITE BIRCH.



CHERRY



COMMON WALNUT.

WOODS.

(Prepared from Specimens kindly supplied by Herbert Stone, Esq.)

by the American variety. The latter, however, although straighter in the grain, lacks both the toughness and durability. The Beech—sylviculturally, a tree of great beauty—possesses qualities of general utility. The wood is tough, and largely employed by the engineer, toolmaker and millwright. Inferior growths are in request for brush-making and turnery, while when of large size it is in demand for the great rollers required by woollen manufacturers. The Elm grows to a large size but branches low, so that pieces of long length are scarce. Its timber is difficult to split, and it is one of the most durable woods for employment under water. It is extensively used by the chairmaker, undertaker and wheelwright, and trees of exceptional dimensions and quality readily find a market with the shipbuilder. The Sycamore is highly esteemed for its close-grained white timber. For dairy utensils and butchers' counters it cannot be displaced. It often exhibits markings of beauty, known as "Fiddle mottle," a term that has been extended to other woods showing a similar figure. From the shores of the Baltic are derived timbers commonly employed for building purposes, namely, the Red Pine and Norway Spruce. The former is the stronger and more durable and, in England, both are chiefly imported into Hull and other East Coast ports. It is shipped ready sawn to sizes, from small scantlings up to 4 by 11 inch deals. On the west coast of England the Baltic goods have a competitor in the Red Pine and Spruce shipped from Canada, but neither of the latter has the strength and durability of the Norwegian species. The principal hardwood received in the United Kingdom from Canada is the Birch, which is imported in the form of both logs and planks. It is the cheapest hardwood on the market, and the coachbuilder and chairmaker take large quantities. *Yellow Pine*.—A most important softwood produced in Canada is the Yellow, or, as it is called in some markets, the White Pine. Of all conifers, its wood is of the greatest value. It may be used for any purpose where lightness combined with moderate strength is required, and the ease with which it may be worked and its capability of taking a finish eminently fit it for the work of the cabinet-maker and joiner. The pattern-maker prefers it to all other woods as it does not shrink or warp, but care must be taken that it is thoroughly dry before use. For general purposes, however, the United States is the principal feeder of the British timber supply, but shipments are declining in quantity owing to the extraordinary increase in America's own manufactures. The American Walnut is a valuable furniture wood. Its importation in the log has almost entirely ceased, being commonly seen in the form of sawn boards and planks. In fact, the general tendency with all American timbers during the past few years has been to place them on the British market as near as possible in the form in which they are destined to be consumed, so that freight has not to be paid on the slabs, the wastage in sawing and the inferior parts of the tree. The boards arrive graded, according to agreement arrived at between producers, in prime, medium and common qualities. At one time gunstocks

were made only from the European Walnut, but for some years the American Walnut has been almost exclusively employed for that purpose. The Satin Walnut, which is simply a trade name for the Red Gum, and belongs to an entirely different natural order, is shipped in large quantities. It is only suitable for the commoner classes of furniture. The wood twists badly and cannot be relied upon even when thoroughly dry. Owing to the amount of gum residing in the pores it is highly hygroscopic and must be employed with caution in a climate as that of the United Kingdom. Large tracts of Red Gum or "Satin Walnut" are found growing upon low-lying swampy land, where the nature of the soil does not supply the material to give the wood uniformity of colour or a defined heartwood. Such trees are sawn and imported into Great Britain under the trade name of "Hazel Pine." It satisfies the call for a cheap furniture wood that is easy to work, and is generally shipped in boards ready planed for use in different thicknesses. The Canary Whitewood, which is a species of Magnolia, is a common wood in the United States. It grows to a large size and produces a timber of a rich canary colour and very free from defects. As a furniture wood it is greatly in request. America does not now care to export her best timber, as it brings a better price in her own market. Boards of prime quality, great width and uniform colour always find a waiting market, but the qualities most frequently imported are the medium and the common. The American Elm, used for bending; the Maple, both plain and figured, the latter being called "Bird's-eye" or "Landscape" Maple; the Ash, largely used as a substitute for the English Ash, and the Basswood, or American Lime, are all shipped to Great Britain in moderate quantities. *Pitch Pine*.—The Pitch Pine, so named from the abundance of its resinous products, is plentiful in the Southern United States. The wood is clean and straight in the grain, a famous building timber, but too hard for the cabinet-maker. It can be procured in long lengths and at one time was in request for masts and spars, for which purpose, however, it has been largely displaced by iron. *Californian Redwood*.—From California the Redwood is obtained. It is a very close relative of the famous Mammoth tree, from the wood of which it cannot be distinguished. The purpose for which it is most generally employed is cabinet-making, and it is said to be of much value for large signs. It is imported into the United Kingdom only in sawn planks usually of great widths, four and five feet not being uncommon. By some the wood is known as Sequoia, the Indian name. For high-class ornamental woods no part of the world is richer than the West Indies and Central America. It is the quarter of the globe from which we obtain the true Mahogany. Mahogany was first imported in 1597, and ever since has been without a serious competitor. One of the most useful woods known, it may be applied with confidence to an innumerable variety of purposes. Its colour improves with age, it takes a brilliant polish, while it is frequently so beautifully figured that over £1,000 has been paid for a single

log. The permanence with which it retains its form recommends it to the pattern-maker, and the shipbuilder, shopfitter and cabinet-maker hold it in the highest esteem. Figured logs, being so expensive, are mostly cut into veneers, the harder variety that comes from San Domingo and Cuba being divided with the saw, and the softer kinds from Tabasco, Honduras and Mexico being knife-cut. The latter is the more economical method of converting into veneers, as there is no waste in sawdust and much thinner sheets are possible. From Demerara we obtain the Greenheart, an invaluable wood for piles and pier work. It is remarkably straight in the grain, very tough, and can be obtained in logs of exceptional length, but, not being as plentiful as the market requires, it is rapidly being supplanted by several timbers from Australasia, which will be enumerated by and by and which appear to enjoy a similar immunity from the ravages of xylophages (wood-eaters) generally.

Lignum-Vitæ.—*Lignum-vitæ* is also produced in the West Indies, and is one of the heaviest and hardest woods known. It only grows to a small size, being seldom met with of a greater diameter than 12 inches. The large pieces are carefully selected for soundness and homogeneity of grain and are turned for use on the bowling green. The small wood is taken by the shuttle-makers and block-makers. For shaves it is the best of woods, wearing well and being almost imperishable, while the property of requiring no lubricant but water commends it also to the engineer for many important services. The great forests of the Amazon basin, Bolivia and Brazil are as yet little known, but their potentialities as a source of timber supply are fully recognised. Small quantities of Rosewood, Snakewood, Tulipwood, Brazil-wood, Violet-wood, Kingwood and Partridge-wood arrive in England from time to time, each of them famous for beauty of colour and figure. The only wood exported from Argentina is the Quebracho, which is rich in tannin and valuable for its extractives. It is a very hard wood and, when employed for such a purpose as railway sleepers, is said to be almost imperishable. West Africa as a timber-producing country is one of the richest in the world. The development of its trade in Mahogany is almost without parallel. In 1895 Liverpool received 3½ million feet, in 1900 14 million feet, and in 1906 no less than 20 million feet, and still the demand is greater than the supply. Large quantities are transhipped *via* Liverpool to America, and amongst consumers both in Great Britain and the United States the wood is being regarded with increasing favour. The African Mahogany is not so hard or so close-grained as that from the West Indies, but it compares well with that from Central America, and, as the forest resources of the latter country are approaching exhaustion, the Mahogany from West Africa admirably fills the breach. A West African wood that deserves mention is the Iroko. It is very plentiful, is similar in colour, almost equal in strength and quite equal in durability to the East Indian Teak, to which wood it will in the near future prove a serious competitor. South Africa

exports no timber. It is a country without any great forest wealth and active conservation is practised by its Forestry Department. The absence of efficient means of communication makes it improbable that the vast forests of Central Africa will be exploited for many years to come. From the Caucasus we procure the Olive wood. Large quantities of this are made up in Birmingham into relics of the Holy Land. The principal timber exported from that part of the world, however, is the Boxwood. For rule-making, mathematical instruments, musical instruments and ornamental turning the wood has a constant demand. It commands a high price, which is maintained by the facts that political troubles have diminished the supply and that, in spite of many other woods having been recommended as a substitute, no wood has hitherto been found to take its place. Its use by the wood-engraver is not so extensive as it was some years ago, illustrations now being very generally prepared by the half-tone and other processes. The most useful woods produced by India, Burma and Ceylon are the Teak, Sal, Sissoo and the Padouk. The Teak is a wood eminently fitted for the use of the shipbuilder and railway-carriage-builder. Moderately heavy and easily worked, one of the most durable woods known, it does not suffer in contact with iron and is rarely if ever attacked by the white ant. Large quantities are imported, mostly in the form of prime planks, and, from a constructional standpoint, it is the dearest hardwood on the British market, its value in 1907 being about 8 shillings per cubic foot. The Sal, Sissoo and Padouk are woods with a high reputation for ordnance work, Padouk also being frequently used as a high-class furniture wood. The finest Padouk, however, is that produced in the Andaman Islands. Considerable quantities of Teak are imported from Java, but it is generally softer, shorter in length and altogether inferior to the Teak from Burma. Australia is the home of the Eucalypts, the Jarrah, Karri, Blue Gum, Iron Bark and Blackbutt, all being now comparatively familiar in the United Kingdom. The applications, however, are purely for purposes of construction. They are procurable in long lengths when required, the trees growing to an immense size, second only in height to the Mammoth Redwood of California. For pier and bridge work, piles, railway wagons and sleepers, each of the Eucalypts has qualities to recommend it. A Tasmanian conifer, the Huon Pine, and the Tasmanian Blackwood, a probable substitute for the American Black Walnut, both deserve the attention of the consumer in Great Britain. New Zealand has valuable conifers in the Kauri Pine, the White Pine, the Totara and the Matai. The Kauri Pine has been known in Great Britain for many years, but the others have only been recently introduced. The White Pine, which yields a clean, straight timber, easily worked, will possibly supply the deficiency experienced in the American Canary Whitewood, while the Totara has been recommended as a substitute for the Virginian Pencil Cedar, with which wood, although a trifle harder, it has many characters in common.

Timbuktu, or TIMBUCTOO, capital of the Military Territory of French Soudan, Africa, 9 miles N. of the left bank of the Niger in 16° N. and 5° W. Under the sway of native kings it was formerly a place of power and population, but since it was occupied and annexed by the French in 1894 it has declined in both respects, though the inhabitants now have a sense of security once lacking. There are local industries of cotton-weaving, pottery, embroidery and leather work, but the town owes its consequence mainly to its being a great trade emporium. Pop. (estimated), 10,000.

Time can be measured by any phenomenon which is periodic and regular. The rotation of the earth, or the apparent rotation of the celestial sphere, was naturally used from the earliest days as a measure of time. [STANDARD OF TIME.] Whatever instrument may be used as a measure of time, some means must be adopted to control it. Thus, though the swing of a pendulum of a clock or the balance-wheel of a watch may be perfectly regular, we must compare the readings on the instrument with some standard, in order to avoid confusion between different timekeepers. In modern times the positions of the sun and certain standard stars have been accurately determined for every day with regard to the meridian of Greenwich. A comparison of the reading of a watch or clock with an observation made on one of these fixed objects enables the error of the watch to be found and so corrected. Several observations made in this way will give the rate of gain or loss of the watch. Sundials have been used from very early days to determine the time, and water or sand clocks were the rough gauges in remote antiquity. The regulation of these primitive timekeepers can have been at best only an approximation, but in the time of Hipparchus (who flourished in the 2nd century B.C.) the right ascensions of certain stars—one of which culminated every hour—were used as references. Nowadays elaborate systems of astronomical measurements have given a means of accurately obtaining mean solar time, and it is quite easy to correct the time as shown by the sun on a dial to this standard time by the application of the equation of time, the value of which is given for every day in the year in the Nautical Almanack. The time at different places on the earth's surface is naturally different, only those places on the same meridian being alike in this respect. Thus, when it is 12 o'clock at Greenwich, it is an hour later 15 degrees to the east and an hour earlier the same distance to the west, a difference of four minutes of time corresponding to every degree in longitude. Birmingham time will therefore be earlier than Greenwich time by 7 minutes 24 seconds. On account of the rapidity with which different places are now put into communication with each other, both by means of railway and telegraph, the local time of a place has gradually fallen into disuse, and it is customary to use Greenwich time over the whole of Great Britain; this naturally greatly facilitates the construction of railway timetables, and in many ways is extremely convenient. The legend "Synchronised hourly from Greenwich"

now seen on clocks throughout England shows how important this convention is considered. Paris time is adopted all over France, while Holland and Belgium use Greenwich time, and Germany and Switzerland adopt Central European time, which is one hour earlier than Greenwich. It has been suggested that Greenwich time should be used all over the world, which would mean that people would have to get accustomed to the new time of day suggested to their minds by the mention of any hour; in New York, for instance, noon would not then be 12 o'clock, but would be 3 minutes 56 seconds past 7 P.M. This suggestion has not, however, been favourably received. The United States extends between 65° W. and 125° W. approximately, thus covering about 60° ; hence there will be a difference of four hours between the times in the eastern and western States. A conventional division of the States into four time-regions is therefore adopted. Between longitude $67\frac{1}{2}^{\circ}$ and $82\frac{1}{2}^{\circ}$ that time is accepted which corresponds to longitude 75° , i.e., five hours earlier than Greenwich—this is known as Eastern time; from $82\frac{1}{2}^{\circ}$ to $97\frac{1}{2}^{\circ}$ it is Central time—an hour earlier than Eastern; between $97\frac{1}{2}^{\circ}$ and $112\frac{1}{2}^{\circ}$ Mountain time prevails, and lastly between $112\frac{1}{2}^{\circ}$ and $127\frac{1}{2}^{\circ}$ they have Pacific time. It is thus 5 o'clock in the Eastern region when 2 o'clock is registered in the Pacific. On board ship it is customary to make the time correspond to the longitude at noon every day. In crossing from Liverpool to New York the boat will increase its longitude about ten degrees a day; so, when the clocks and watches show that 24 hours have elapsed since the previous noon, it yet wants 40 minutes to the true noon of that meridian in the ocean; when the true noon arrives, all the ship's watches and clocks are promptly put back 40 minutes. If this were not done, the time shown by the clock would bear no relation to the actual part of the day, and on arriving at New York an error of five hours would have accumulated. The ship's chronometer, however, goes steadily on, and the difference in time shown between it and the mean time obtained from corrected observations of the sun gives the longitude of the ship. The importance to navigation of an accurate chronometer is therefore enormously great. In travelling round the world with the sun the hands of a watch would have to be put back 24 hours in all by the time that it got back to its starting-point; this is popularly expressed by saying that a day is lost in the journey. This leads to a curious confusion in the name of the day. Imagine that it is 12 o'clock noon on a Wednesday at Greenwich; at New York it is about 7 o'clock in the morning of the same day, while Pacific time gives it as only 4 A.M. Farther on it would be, say, 1 A.M. of the same Wednesday, while in Japan it might be considered as 9 P.M. on Tuesday. But if we took countries to the east of Greenwich, we should find that when it is 12 o'clock on Wednesday there, St. Petersburg records two hours later, on the meridian of Calcutta it is 6 o'clock on Wednesday evening, and in Japan three hours later on the same day. According to this, then, it may be 9 o'clock in Japan on either Tuesday or Wednesday, while it is noon in England.

To overcome this inconvenience, the meridian of 180° is chosen as the critical point where the day suddenly changes its name. A ship, travelling westward, say 179½° W., on a Tuesday, will, after crossing the meridian of 180°, suddenly assume it to be Wednesday, although only a few hours have elapsed. If it arrive there at midnight on Monday, Tuesday becomes avoided altogether. But a vessel travelling to the east across this line has one day twice over; thus, if it reaches the line at 11 P.M. on Tuesday, the time is suddenly said to be 11 P.M. on Monday, and so Tuesday comes over again.

Times, THE, the leading newspaper of England, was founded by John Walter (1739-1812) in 1785 under the title of the *London Daily Universal Register*. From January 1st, 1788, onwards it was called *The Times*, the old name being retained for a while as a sub-title. It did not meet with any remarkable success until the appointment of the second John Walter (1776-1847) as manager (1803). Owing to his energy in collecting recent and trustworthy news from all parts of the world, as well as the ability and independence of its criticism of the Government policy, *The Times* rose rapidly in public estimation. Its sale was greatly increased after the adoption of the Koenig steam printing-press in 1814. The leading position always maintained by *The Times* must in large measure be ascribed to its successive editors, Sir John Stoddart (1812-16), Thomas Barnes (1816-41)—who was ably seconded by the "Thunderer" Edward Sterling—John T. Delane (1841-77), and Thomas Chenery (1877-84), who was succeeded by George Earle Buckle (b. 1854). In 1847 John Walter (1818-94), grandson of the founder, became proprietor. His manager, John Cameron Macdonald (1822-83), among other improvements, introduced the Walter press in 1869. *The Times* earned the gratitude of the commercial world by its exposure of the conspiracy hatched in Belgium to defraud the principal banking-houses of Europe (1841). Subscriptions were raised to reimburse the proprietors the enormous cost of the action for libel which the publicity involved and which they successfully repelled, but these they refused to accept. The money was accordingly expended in founding *The Times* scholarships at Oxford, Cambridge, Christ's Hospital and other schools, while a commemorative tablet was erected in the Royal Exchange and over the office of the newspaper in Printing House Square, in the City of London. The publication in 1887 of a series of articles entitled "Parnellism and Crime" brought on a chain of events which lowered the journal's reputation. In other respects *The Times* developed singular undertakings, outside the scope of what had hitherto been regarded as journalistic enterprise. One of these was the publication of books, such as in 1903 *The Times Supplement to the Encyclopædia Britannica* (constituting with the old 24 volumes the 10th edition of that work), on what was known as the instalment system, according to which, in return for a written promise to pay at stated intervals and a small sum down, the customer was at once placed in possession of his complete purchase. Another

was the opening in 1905 of *The Times Book Club and Library*, which involved it in a serious dispute with the leading publishers.

Timoleon, Greek general, was born at Corinth early in the 4th century B.C. He was of noble family and of grand character, and, though he once saved his brother's life, procured his death when he attempted to act tyrannously, atoning for the act by twenty years' retirement. In 344, when fifty years old, he led the Corinthians against Dionysius the Younger, and became master of Syracuse, afterwards driving the oppressors out of Sicily. He then resigned, and led a life of self-sacrifice, dying about 337 B.C.

Timon, the misanthrope, whom Lucian and Shakespeare have brought upon the stage, was born near Athens, and lived during the Peloponnesian War (431-404 B.C.). Various reverses of fortune and desertion by his friends were the cause of his hatred of mankind, and he withdrew into solitude.

Timor, the largest and most easterly of the Lesser Sunda Islands in the East Indian Archipelago, separated from Australia by the Arafura Sea. It is 275 miles long from N.E. to S.W., with an average breadth of 60 miles, and has an area of 12,400 square miles. The surface is rugged and mountainous, reaching a height of 11,500 feet. Timor is less volcanic than the neighbouring islands. Iron, copper, gold, coal and petroleum occur, and the leading crops are wheat, maize, rice, potatoes and coffee, while tobacco, cotton, various palms and other tropical vegetation are cultivated. The inhabitants are a mixed race of Malay, Polynesian and Papuan blood. The island was divided by treaty of 1859 between Holland and Portugal. The south-western half, with an area of 5,000 square miles and a population of about 250,000, constitutes Dutch Timor, the chief town being Kupang; the eastern half, with an area of 7,400 square miles and a population of 300,000 (or possibly nearly 500,000) forms Portuguese Timor, Dilli being the chief town and port.

Timothy, AND **Titus**, EPISTLES TO. The epistles to Timothy and that to Titus are called the "Pastoral Epistles" of St. Paul, because they treat of matters connected with the discharge of the pastoral office. They have many features in common, both as regards style and terminology and the general nature of their contents. As to the latter, the most noteworthy points are the absence of discussion concerning questions of doctrine, which are assumed to be settled, and the importance attached to an organised visible church. It is certain, both from internal and external evidence, that they were composed at very short intervals of time, and cannot belong to an earlier date than the reign of Nero.

Timothy-Grass, or CAT'S-TAIL (*Phleum pratense*), one of the most valuable agricultural grasses, on account of its productiveness and early development, though a British species, was introduced as a novelty from the United States, from which country large quantities of its seed are

imported annually into the United Kingdom. It derives its popular name from its spicate inflorescence, and serves as a badge of the Sutherland family.

Tin (chemical symbol, Sn; atomic weight, 118) is one of the metals which was known to the ancients and of which mention is made in the earliest writings. It is, however, not widely distributed, the most abundant source of the ore being Cornwall, and there seems to be some evidence that the Phenicians obtained the metal from tin mines of that district. The chief ore—indeed, the only one employed for the extraction of the metal—is the dioxide SnO_2 , known as tinstone, which also occurs in Mexico and Australia. For the purpose of obtaining the metal, the ore is first crushed and then washed, in order to get rid of the lighter earthy impurities. It is next roasted in a reverberatory furnace, and by this operation sulphur and arsenic, which are usually present, are expelled. It is again washed to dissolve soluble matters, chiefly copper sulphate, and finally reduced by heating it together with lime and coal slack in a reverberatory furnace, the heat being raised very gradually. A slag is formed by the union of the lime with silicious matters; this rises to the top, while the reduced metal sinks to the bottom and is run off into pans or ingots. The metal is purified by heating slowly and pouring away the more easily fusible portion, which is further purified by melting in a large pot and stirring with a wooden pole. When pure, it is a bright white soft metal, very malleable, so that it may be beaten out into thin leaves (tin-foil). Just below its melting-point, however— 230°C .—it becomes very brittle. It has a crystalline structure, and a rod of the metal emits a peculiar crackling sound when bent. It does not oxidise on exposure to air, but, if very strongly heated, it will burn with a bright white light. Dilute nitric acid oxidises it to a white oxide, and it is slowly attacked by hydrochloric and sulphuric acids. It forms two series of salts, stannous and stannic salts, and of these the most important are the chlorides. Stannous chloride (SnCl_2) is known commercially as salts of tin. It forms bright prismatic hydrated crystals, which are soluble in water, but decomposed by excess. It is a strong reducing agent, and is largely employed as a mordant in dyeing and calico-printing. Stannic chloride (SnCl_4) is also used in a crude and impure state by dyers, and known as composition, while a double salt with sal ammoniac is also employed under the name of pink salt. The artificial stannic sulphide (SnS_2), called mosaic gold, is employed as a bronzing powder; while the dioxide (SnO_2) finds application as a polishing agent for stones, etc., and is extensively used by lapidaries, to whom it is known as putty powder. Tin unites very readily with other metals, e.g., lead or copper, and the alloys are in many cases most important products. Thus, Britannia metal, pewter, Queen's metal and the various varieties of solder are alloys, consisting chiefly of tin and lead. Speculum metal, employed largely for optical purposes, is an alloy of tin and copper; while bronze, gun metal and bell metal con-

tain also essentially the same constituents. The chief use of the metal is, however, for the manufacture of tin-plates. Such tin-plates are used for innumerable purposes, as e.g., the manufacture of basins, jugs, biscuit-tins and the tin vessels for preserved fruits, meats, etc. Chemically, tin is usually recognised by its sulphides, or by reduction before the blowpipe, and is quantitatively estimated in the form of the dioxide.

Tinamomorpha, in Professor Huxley's classification, a name for the Tinamous.

Tinamous, a group of South American birds, of partridge-like aspect, but allied to the Ostriches. They are game-like birds, having the bones of the skull like those of the Struthionies, but since their sternum is keeled, this feature places them with the Carinate series. Some frequent forests and others the open grass lands or pampas. They run with great rapidity, but, their intelligence being limited, readily take alarm and are easily killed. Being much sought after for the table, they have retreated from their former haunts to less accessible regions.

Tincal, a crude and impure borax, which is obtained as deposits in various localities, owing to the evaporation of the water from lakes in which the salt had been held dissolved.

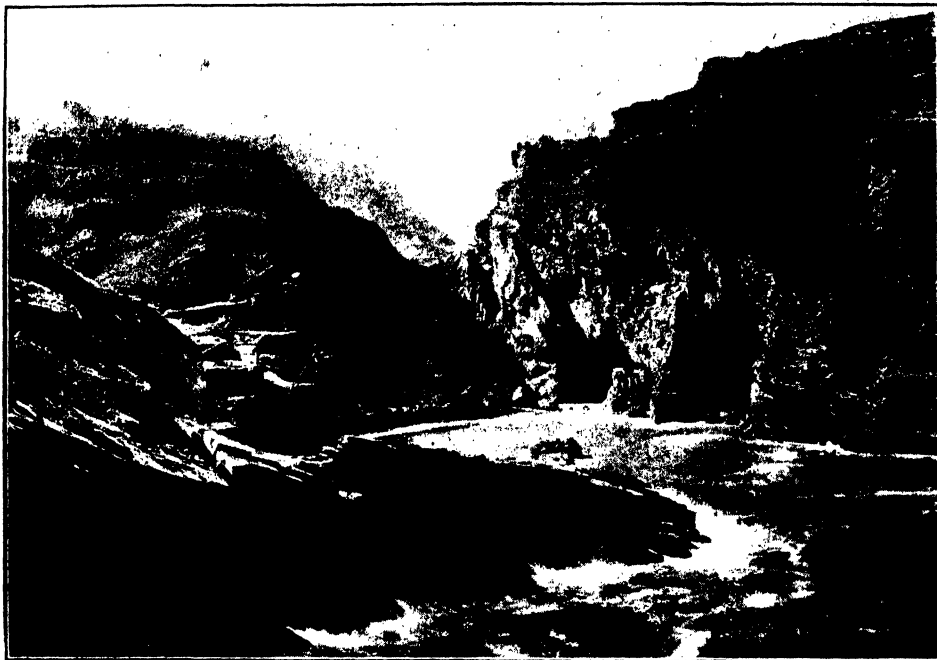
Tincture, a form of medicinal preparation in which certain active principles are extracted and dissolved in spirituous solution. Rectified spirit is usually employed when the substance to be acted upon is a resin or volatile oil; in other instances proof spirit is used. Ammonia enters into the composition of some of the tinctures.

Tindal, MATTHEW, Christian Deist, was born at Beer-Ferris in Devonshire about 1653, and was educated at Lincoln and Exeter Colleges, Oxford. In 1678 he was elected Fellow of All Souls' College and, while James II. was on the throne, professed Catholicism, but afterwards became in turn High Church, Low Church and Deistical. He was admitted an advocate at Doctors' Commons in 1685, and in 1706 created some sensation by his *Rights of the Christian Church asserted against the Roman and all other Priests who claim an Independent Power over it*, an attack on High Church principles and practices, which was ordered by the House of Commons to be burned by the hangman. During many years he published pamphlets and various works distinguished by their learning and straightforwardness, the ablest and most effective being *Christianity as Old as the Creation; or the Gospel a Republication of the Religion of Nature* (1730). He died in London on August 16th, 1733.

Tinder was a substance used as a means of starting fire before the introduction of phosphorus matches. It was an inflammable material, often composed of half-burnt flax or charred linen, and took fire on receiving the sparks caused by the rapid rubbing of a flint and steel. The ignited tinder could not, however, be used directly as a torch, for it only smouldered—no flame was produced. A match dipped in sulphur was first kindled from it, and, after all these steps, the same

point was reached as is now obtained by us after one swift rub of a modern match. Tinder was usually carried in a metal box fitted with flint and steel, the steel in some cases being secured to the inside of the cover, so that the sparks from the flint, when struck against the steel, might fall upon and ignite the tinder.

ing the ear, and may be produced as a result of the administration of certain drugs, notably salicylate of soda and quinine. In all cases in which it is a symptom of other complaints, the causes should be attacked rather than the effect. Strychnine—taken, however, only under medical advice—is the most useful tonic in affection of the ears.



[Photo.]

TINSTAGEL.

[Irish, Reigate.

Tinea, the name sometimes applied to the parasites met with in certain forms of skin disease. For the ordinary tinea (or trichophyton) tonsurans see RINGWORM. The diseases known as favus and tinea versicolor are caused by allied forms of parasites. Favus is usually found on the scalp of children reared in unwholesome surroundings and is very persistent. Extraction of the affected hairs, though a slow process, is believed to be the most effective remedy. Such crusts as may form must be removed by boric starch or other poultices. The treatment for ringworm will apply here, too. Tinea versicolor mostly affects the trunk, occurs generally in those who wear warm clothing day and night, sweat profusely and do not wash their body often or thoroughly. The use of a parasiticide ointment, kept up for some time (even after apparent cure), so as to eradicate the fungus to the presence of which the disease is due, is the best treatment.

Tinnitus Aurium, singing in the ears, is a symptom of certain forms of local mischief affect-

Tin-Plate, iron-plate coated with tin by immersing it in the latter metal. The superior kinds of tin-plate are made from iron refined with charcoal, whereas in "coke-plate" puddled iron is used. The process called "pickling" consists in dipping the plates in hot sulphuric or hydrochloric acid mixed with water in the proportion of 1 to 16. They are then washed, annealed, rolled between chilled and polished iron rollers, annealed again, placed a second time in the sulphuric acid, washed once more, and finally scoured with sand, after which they are ready to receive the coating of tin. This is a highly elaborate process, involving a long series of operations. The manufacture of tin-plate is supposed to have been invented in Bohemia in the early part of the 16th century. It has long been the leading industry of Swansea, though, after the introduction of the tariff legislation in the United States (1890, 1897) associated with the name of President McKinley, for the purpose of protecting the American manufacture, there was some decline in the Welsh output.

Tinstone is the most important ore of tin, and consists chemically of the dioxide of that metal, (SnO₂). It occurs largely in Cornwall, frequently in veins in granite rocks, and associated with ores of iron and copper. It forms prismatic crystals, usually of a brown colour, possessing a specific gravity of about 7, and sufficiently hard to mark glass.

Tintagel, a coast village of North Cornwall, England, 6 miles N.W. of Camelford, the Camelot of Arthurian legend. Its castle, the ruins of which stand on a neck of land uniting the promontory of Tintagel Head with the mainland, is famous as one of the reputed birthplaces of King Arthur. The oldest part of the remains is of the Norman style, and very probably a British stronghold occupied the site before the fortress was built. It was sometimes used as a prison as late as the 14th century, but afterwards fell into decay, the office of Constable of Tintagel Castle being abolished in 1580.

Tintern Abbey, on the right bank of the Wye, Monmouthshire, England, about 5 miles N. of Chepstow. It is charmingly situated in the bosom of wooded hills and is one of the most beautiful architectural remains in the kingdom. The abbey, founded for Cistercian monks in 1131, was designed in the Transition style between the Early English and Decorated periods and is renowned for its chaste composition and delicate workmanship. After the dissolution of monasteries it gradually became ruinous, but is now well cared for. One might almost say, in the words of John Keats, "Its loveliness increases; it will never pass into nothingness." It is associated with William Wordsworth's noble poem, "Lines composed a few miles above Tintern Abbey."

Tintoretto, L., painter, was born at Venice on September 16th, 1518 (though some authorities make him six years older). He received his cognomen from his father's trade, that of a dyer, his real name being JACOPO ROBUSTI. He began his studies under Titian, but abandoned that painter's *atelier*, and pursued them with such fervour after his own manner that Sebastian Del Piombo declared it would take him two years to paint as much as Tintoretto could do in two days. He produced a large number of works, chief amongst which are his "Crucifixion," Marriage of Cana," "Last Supper," "Belshazzar's Feast," "Last Judgment" and "Slaughter of the Innocents." Some of these were executed for Venetian churches. His colossal picture of "Paradise" (74 feet by 30 feet) is one of the largest paintings ever made on canvas. His imagination is of the boldest and most effective kind, and his treatment of chiaroscuro is often magnificent. He died in Venice on May 31st, 1594.

Tipperary, a county of the province of Munster, Ireland, bounded on the N.W. by Galway, on the N.E. by King's County, on the E. by Queen's County and Kilkenny, on the S. by Waterford, on the S.W. by Cork and on the W. by Limerick and Clare. It occupies an area of 1,659 square miles.

The surface is varied and picturesque. In the south are the Knockmeledown Mountains (2,609 feet) and the Galtee Hills (3,008 feet), while in the northern half are the Devil's Bit, near Templemore, and Keeper Hill (2,265 feet). The Suir is the principal river, although the Shannon is a natural boundary on the north-west. The minerals include coal, copper, lead, zinc, manganese, slate and pipe-clay. The soil is fertile and yields crops of oats, barley, wheat, rye, potatoes and turnips. Live-stock, reared on an extensive scale, comprises cattle, sheep, pigs, horses and mules, asses, goats and poultry. The industries are of slight importance, but linen manufactures and flax-spinning are carried on. There are round towers at Roscrea and the rock of Cashel, the ecclesiastical remains at the latter place being among the most remarkable in Ireland. The abbey of Holy Cross is one of the finest monastic relics in the island. Tipperary (6,216) is the county town, but New Tipperary, founded by William O'Brien during the Plan of Campaign (1886-91), is now practically abandoned. Laurence Sterne was born at Clonmel in 1713. Pop. (1901), 160,232.

Tippoo Sahib, Sultan of Mysore, the son of Hyder Ali, was born in 1749 and trained, under European officers, to a military career, in which he distinguished himself. He succeeded his father in 1782. His intense hatred of Great Britain was developed early, and in his youth he attempted to wreak his vengeance on all who favoured her. He took a prominent part in the war which was raging in 1782, but consented to a treaty in 1784. From 1790 to 1792 he was again at war with the British, who pressed him hard, and a third war broke out in 1799. He was killed at Seringapatam (May 4th, 1799), which was successfully stormed by the British, and with his death was destroyed, perhaps, the last really important obstacle to British rule in India. He was mercilessly cruel to his prisoners and relentlessly forced Islamism on the inhabitants of the Malabar coast.

Tipton, a town of Staffordshire, England, 4½ miles S.S.E. of Wolverhampton and 1½ mile N. of Dudley. It is one of the centres of the iron industry, especially of heavy forgings and castings for the home and foreign markets. Ironstone and coal occur in the vicinity, and galvanising, cement works, fire- and blue-brick works and malting are also carried on. Pop. (1901), 30,543.

Tiryns, a city of the Peloponnesus, ancient Greece, situated on a small rock of oval form in the marshy plain of Argolis, to the S.E. of Argos, about 3 miles N. of the Argolic Gulf. Its "Cyclopean" walls belong to a period anterior to the Dorian immigration. About 468 B.C. it was destroyed by the people of Argos. The excavations of Dr. Schliemann (1884-5) brought to light a palace of the 11th or 10th century B.C.

Tischendorf, LOBEGOTT FRIEDRICH KONSTANTIN VON, Biblical critic, was born at Lengenfeld, near Plauen, Saxony, on January 18th, 1815. He was educated at the Plauen gymnasium and studied theology at Leipzig, where (in 1845) he

became professor. Before this he had travelled in various parts of Europe, examining and deciphering old MSS., and afterwards visited Egypt, Sinai, the Holy Land and the Levant and brought back from Sinai part of what became known as the Codex Sinaiticus, a very remarkable discovery. He made later journeys (1853 and 1859) to the East and during the second he induced the Sinaitic monks to part with the rest of the Codex and present it to the Tsar, who had borne a major share of Tischendorf's expenses and at whose cost the Codex was published in 1862. Tischendorf's labours on the text of the New Testament had extended over many years and culminated in the great edition (the eighth) published in 1869-72. In 1869 he was ennobled and died at Leipzig on December 7th, 1874. His work on the Septuagint is of lesser significance than are his researches on the New Testament.

Tissues, VEGETABLE. [HISTOLOGY, VEGETABLE.]

Tit, the popular name of a bird belonging to the typical group of the Passerine family *Paridae*. The birds of this group are widely distributed, but more abundant in the northern than in the southern hemisphere. The short, strong bill is feathered at the base, the wings are of moderate length, the tail is rounded or even, the legs are slender, and the long, curved claws give these birds a firm grip of the branches of trees, to which they often cling back downwards in search of insects, which constitute their chief food. Grain and fruit, however, do not come amiss to them; at times they will feed on carrion, and they occasionally prey on young and sickly birds. The Blue Tit (*Parus coruleus*) and the Coal Tit (*P. ater*) are the commonest British species. The former owes its name to the bluish tinge in its plumage, the latter to its black head and neck. The Great Titmouse (*P. major*), or Oxeye, about six inches long, is black on the head and throat, white on the cheeks, yellowish on the back, breast, and sides, and has the wings and tail grey. The Crested Tit (*P. cristatus*) is rare and local. The Long-tailed Tit (*Acredula caudata*), also called the Bottle Tit from the shape of its nest, is common. The Marsh Tit (*P. palustris*) is rare, as is the Bearded Tit or Reedling (*Panurus biarmicus*), which belongs to another family.

Titanium (chemical symbol, Ti; atomic weight, 50) is a rare metal, which was discovered towards the close of the 18th century in the mineral menaccanite. The pure metal is only obtained with much difficulty, and, if heated in air or oxygen, burns with great brilliancy. Its oxide (TiO_2) is the chief source of the metal and its compound, and is remarkable, as it occurs in three distinct crystalline forms of varying specific gravity and other physical characters. These forms are known as anatase, rutile and brookite. With alkalis it forms unstable salts, the titanates, but neither these nor the salts of titanium itself are of any commercial importance.

Titans, in Greek mythology, were the six sons and six daughters of Uranus (Heaven) and Ge

(Earth). They rebelled against Uranus and deposed him, setting up Kronos, the leading Titan, in his stead. The Titans, in their turn, were vanquished by Zeus, the son of Kronos, and hurled into Tartarus.

Tithe is an incorporeal hereditament payable by the inhabitants of a parish for the support of the Church, and generally payable to the parson, and is the tenth part of the increase yearly arising and renewing (1) from the profits of the lands, (2) from the live-stock upon lands, and (3) from the personal industry of the inhabitants. The first species of tithe is known as predial, and consists of corn, grass, hops, wood, and the like; the second, mixed, as of wool, milk, pigs, etc., consisting of natural products, but nurtured and preserved in part by the care of man; the third, personal, as of manual occupations, trades, fisheries, and the like. The distinction between predial and mixed tithes is that predial tithes (so called from the Latin *prædium*, "a farm") are those which arise immediately out of the soil, either with or without the intervention of human industry, and mixed are those which arise immediately through the increase or produce of animals which receive their nutriment from the earth and its fruits. Personal tithes are so called because they arise entirely from the personal industry of man. In addition to this distinction, tithes are divisible into two classes, namely, great and small; the great tithes comprehending generally the tithes of corn, peas, beans, hay, and wood; and small tithes all other predial, together with all mixed and personal, tithes. Tithes are great or small, according to the nature of the things which yield the tithe, without reference to quantity. Thus, clover-grass made into hay is of the nature of all other grass made into hay, and consequently is a great tithe; but, if left for seed, its nature becomes altered, and, like other seed, it becomes a small tithe. The Tithe Commutation Acts have substituted a yearly rent-charge varying in amount for tithe. By the Tithe Act, 1891, it is payable by the landowner to the tithe-owner. Every contract between landowner and occupier made after that Act for payment of it by the occupier is void; and the occupier has ceased to be bound by any such contract made before that Act, being liable, however, to repay to the landowner such sum as the landowner has properly paid on account of tithe rent-charge to the tithe-owner. When the rent-charge was in arrear for twenty-one days, the remedy was, until 1891, in every case by distress on the land; but the Tithe Act, 1891 (54 Vic., c. 8) has effected a great change in this respect. By that Act, in the ordinary case of land being let by the owner to a tenant, the remedy of distress by the tithe-owner is abolished; and recovery through a receiver, appointed by the County Court of the district, is substituted, except where the land is in the occupation of the landowner, in which case an officer of the Court may distrain for it. The landowner, also, in case of a contract before the passing of the Act (March 26, 1891) binding the occupier to pay tithe, may recover by

distress on the occupier any sum he may have paid the tithe-owner on account of tithe. By the same Act (sec. 8) a remission of tithe rent-charge for any one year, exceeding two-thirds of the annual value of the land out of which it issues, may be obtained from the County Council, as in the case of landlord and tenant.

Titian Vecelli (called universally by his Christian name), painter, was born at Pieve di Cadore in Friuli, province of Udine, Italy, in 1477. At the age of eleven he was sent to Venice with his brother to take lessons in drawing from Zuccato, Gentile Bellini and Giovanni Bellini. Details concerning his early life are somewhat scanty, and it was not till 1507 that he was engaged on any work of importance, being then occupied in fresco-painting with Giorgione. The influence of the latter is strongly marked in his earliest paintings. About 1512 he executed his famous picture of "The Tribute Money," and in the next year was commissioned to paint "The Battle of Cadore" on the walls of the Hall of Council, in Venice. This work, owing to his being largely employed by Pope Leo X. at Rome, was not finally completed till 1537. His fame steadily increased, and there was a demand for his services at various courts, and by his careful business methods he amassed large sums of money. In 1523 he married, his wife dying in 1530, leaving him two sons and a daughter. One of the sons became a bishop, but his profligacy was such that Titian's later years were rendered unhappy by reason of it. The other son became a painter of some ability. In 1532 Titian was introduced to the Emperor Charles V., whose portrait he painted, being rewarded by a life-pension. From 1545 to 1546 he was in Rome, fêted by his numerous admirers. He died at Venice on August 27th, 1576, of the plague then ravaging the city. He stands, with Michael Angelo and Raphael, his contemporaries, at the head of the Italian Renaissance, and has been described as the greatest painter of romantic landscape, as well as of dignified, and sometimes sublime, portraiture. His marvellous sense of colour has been the wonder of the great critics of the Italian painters. His best-known paintings are "St. Sebastian," "The Annunciation," "Christ in the Garden," "Danâe," "Noli me Tangere," "Medea and Jason," "Venus and Adonis," and "Bacchus and Ariadne." The National Gallery in London possesses some fine works of his, including the last-mentioned.

Titians, or TIETJENS, THERÈSE CAROLINE JOHANNA, singer, was born at Hamburg of Hun-

garian parents in 1834. She gave early signs of her future triumphs in opera, making, at the age of sixteen, a remarkable *début* in Hamburg as "Lucrezia Borgia." She made her first appearance in London in 1858 in the part of "Valentine," in *The Huguenots*, and her welcome was so enthusiastic and spontaneous that thenceforward she made her home in England. In grand opera she remained, until her retirement, almost without a rival, her "Lucrezia," "Semiramide," "Countess Almaviva," "Fidelio" and "Medea," "Donna Anna" and "Valentine" being her greatest parts. She was equally successful in oratorio and on the concert platform. For twenty years she served the public with perfect loyalty, and her magnificent soprano voice, the power of which was beautifully qualified by its sweetness, bore the wear and tear of con-



"THE HOLY FAMILY."

(By Titian Vecelli, in the National Gallery, London.)

tinnous hard work with scarcely a trace of deterioration. Incurable disease hastened her withdrawal from the stage, but the scene at her farewell concert in the Royal Albert Hall in 1876, probably without parallel, demonstrated to her completely the firm and affectionate hold she had on all music-lovers. She died in London on October 3rd, 1877.

Titlark. [PIPIET.]

Titus FLAVIUS VESPASIANUS, Roman Emperor, was born in A.D. 40. He was the son of the Emperor Vespasian, and, entering the army in youth, served under his father, assisting in the capture of Jerusalem, the siege of which he had conducted with marked ability, in 70. The Arch of Titus was erected in Rome, some years afterwards, in commemoration of his exploit. His father was of humble origin, and managed to obtain great honours, and finally the crown itself, by his military prowess. He succeeded Nero in 66,

and left his son to complete the conquest of Jerusalem. On the return of the latter, they shared the royal dignity till 79, when Titus the Younger became the sole emperor. Both left excellent memories, their wise and benevolent rule endearing them to the people. It is believed that Titus, to whom we owe the completion of the Colosseum, was poisoned by his brother Domitian. At any rate he died suddenly in 81. His reign was memorable for the great eruption of Vesuvius in 79 and the Roman conquest of Scotland, under Agricola, as far as the Tay in 80.

Titus. [TIMOTHY.]

Tiverton, a town of Devonshire, England, on the left bank of the Exe, 14 miles N. of Exeter. James I. granted it a charter of incorporation in 1615. The principal buildings are St. Peter's Church, restored in 1853-6, mainly Perpendicular, but containing a Norman doorway; the Free Grammar School, founded by Peter Blundell in 1604 and reorganised in 1876, among whose *alumni* were Archbishop Temple and R. D. Blackmore, author of *Lucina Doone*; the Bluecoat Middle Boys' and Girls' School, dating from 1714; the School of Science and Art; the town hall and the market house. Tiverton Castle, now a farm and private residence, was built about 1106 by Richard de Redvers, 1st Earl of Devon of that family. Lord Palmerston ("the Tiverton pet") represented the town from 1835 to 1865. The former woollen industry is extinct, but there are important manufactures of lace, besides breweries and flour-mills. Pop. (1901), 10,382.

Toad, an animal belonging to the Amphibian genus *Bufo*, type of a family (Bufonidae) distinguished from the Frogs (Ranidae) by the want of teeth, the warty skin, and the short hind legs. Of the type-genus, universally distributed except in Australia, there are fifty-eight species, of which but two are British—the Common Toad (*B. vulgaris*) and the Natterjack or Rush Toad (*B. calamita*). The former is abundant, and frequents damp places, coming out at dusk in search of insects, slugs, and worms; the latter, readily recognised by the bright yellow line running down the back, is rarer, and is generally found in dry places. Gilbert White records the fact that in his garden at Selborne they were more abundant than common toads. The toad is heavier and more stoutly built than the frog, brownish-grey in colour, with the glands above the ear greatly developed so as to form prominences. It is erroneously supposed to "spit" poison; but is in no wise venomous, though the secretion from the skin is acrid, and when startled or irritated it will often eject clear watery fluid from its vent. Toads hibernate in winter, and in spring the long strings of eggs may be seen floating in ponds.

Toadflax, the popular name for the scrophulariaceous genus *Linaria*, derived from the flax-like foliage of the common species *L. vulgaris*, the prefix toad being a contemptuous indication of its valuelessness for fibre. This genus is distinguished from the closely-allied snapdragons (*Antir-*

rhinum) by the corolla having a spur in lieu of a pouch.

Toadstools, the name ignorantly applied indiscriminately to all agariciform fungi except the mushrooms, at first from the curious ancient belief that they owed their origin to toads, as puff-balls were supposed to owe theirs to wolves, and the deer-ball truffle (*Elaphomyces*) to deer. The name now implies worthlessness or a poisonous character, whilst many fungi so stigmatised are in reality valuable though neglected articles of food.

Tobacco (the name is variously derived from "tabaco," the name of the pipe or tube in which the West Indian natives smoked the plant at the time of Columbus's voyages, and from the West Indian island of Tobago, near Trinidad, which has an area of 114 square miles and a population of 18,750 and where its cultivation has been established), the leaves of several species of the solanaceous genus *Nicotiana*, prepared for use as a narcotic, by smoking, chewing, or inhaling (as snuff). It is the most widely used of narcotics, its employment in all three ways being made known to Europe by Columbus and the Spaniards between 1492 and 1502. The plant was brought from Mexico to Spain in 1558, and Jean Nicot, French ambassador to Portugal, having sent seeds to Catherine de' Medici, the plant has been given his name. Smoking in Europe was mainly the result of English example after Sir Francis Drake's return from Virginia in 1586, and spread rapidly, in spite of James I.'s *Counterblast*, of Papal bulls, of sultans' sentences to death, and of the Russian knout. Though Sir Walter Raleigh was never in Virginia in his life, there is reason to believe that he sanctioned experiments with the plant which his servant Harriot brought back to England about 1586 and that he was the first Englishman of rank to smoke it. Most tobacco, and that of the best quality, is the product of *N. Tabacum*, the Virginian tobacco, a coarse-growing, viscid, unbranched annual, six feet or more high, with scattered simple leaves, sometimes two feet long, the upper ones amplexicaul or decurrent, and a panicle of pink flowers with long corolla-tubes. It is the source of Virginian, Cuban, Manila, Latakia, and Turkish tobacco. The Bornean leaf is in great demand for cigars and for the casing of cigars made from tobacco of coarser texture. *N. rustica*, or Green tobacco, a smaller, much-branched plant, with a shorter, greenish corolla, originally a native of Brazil, is cultivated in the East Indies; a white-flowered species, *N. repanda*, is said to furnish some of the finest Havannah cigars; and *N. persica*, the tobacco of Shiraz. Tobacco does best with a mean annual temperature of not less than 40° F., no early autumnal frosts, and a low rainfall; it is an exhausting crop, requiring abundant manure rich in potassium-nitrate, and thus necessitates an extensive area for the plantation, some of the ground lying fallow for a time, while other tracts are under cultivation. In Europe it is sown in hot-beds in March, transplanted in May and harvested in September. Each plant should have 8 to 12 large leaves.

These are gathered when beginning to droop; allowed to wilt, or sweated for three or four days; "cured" either slowly by currents of dry air, or quickly by artificial heat, rising in four or five days to 170° F.; rendered soft by the admission of damp air; stacked and allowed to ferment for from three to five weeks. Tobacco leaves contain 18 to 22 per cent. of ash, principally calcium carbonate, and potassium salts, besides salts of ammonia and nitrates. They have also 25 per cent. of albuminoids; 10 to 14 per cent. of malic and citric acids; 7 or 8 per cent. of cellulose; from 4 to 6 per cent. of resin and fat; about 5 per cent. of pectic acid, and 1 or 2 per cent. of oxalic; acetic acid, increasing during fermentation and reaching 3 per cent. in snuff; from 1.5 to 9 per cent. of the acridly poisonous, colourless, liquid, volatile alkaloid nicotine ($C_{10}H_{14}N_2$), and a solid camphor-like substance, nicotianine. The nicotine increases in the leaves with age, and is mainly destroyed when the tobacco is burnt, though it also occurs in the remaining oil. The proportion of nicotine determines the strength, but not the flavour, of the tobacco. In snuff the malic and citric acids are largely destroyed, and free ammonia is present, giving the snuff its alkaline pungency. Many habitual smokers find that tobacco relieves bodily or mental fatigue; strong tobacco may undoubtedly produce the disease of the eyes known as amblyopia; and the excessive use of tobacco, especially by the young, seems to affect both the digestion and the nervous system injuriously, inducing more particularly affections of the heart. Most countries have made the cultivation and importation of tobacco a source of revenue. Though it cannot be relied upon as a crop in the climate of Great Britain, its cultivation is chiefly prevented by fiscal prohibitions, though experimental cultivation on a small but sufficient scale has been sanctioned in Ireland from time to time. During the year 1906 tobacco was grown on 796,099 acres in the United States, the production being 682,428,530 lbs., the value of which amounted to 68,232,647 dollars. In 1905 there were 16,798 tobacco and cigar factories, employing 168,644 persons. The value of the tobacco imported into the United Kingdom in 1906 was £1,734,062.

Tobas, a South American people still dominant on the banks of the Pilcomayo, Gran Chaco (parts of Bolivia, Argentina and Paraguay). They are a fierce, savage tribe, much dreaded by all the surrounding natives. All efforts to reduce them have hitherto failed, and in 1882 Jules Nicolas Crevaux (b. at Lorquin in Lorraine in 1847) and all his companions were massacred by the Tobas while attempting to reach Paraguay from Bolivia by the Pilcomayo route.

Tobit, BOOK OF, an apocryphal book of the Old Testament, probably written by a Hellenist of Egypt towards the middle of the 2nd century B.C. It describes the misfortunes, patience, and ultimate deliverance of Tobit, a Jew of the tribe of Naphtali, who had been carried captive to Nineveh. Deprived of the riches he had acquired as a trader through his disobedience to a royal edict which forbade the burial of his countrymen, and reduced

to the lowest depths of misery, he sends his son Tobias to Media to demand the repayment of a loan. Tobias, who is protected by the angel Raphael, not only obtains the money, but slays a fish (probably the crocodile) in the Tigris, the heart and liver of which serve as a charm against the demon Asmodeus, whilst its gall cures his father's blindness. From the traces of Zoroastrianism apparent in the tale, it may be gathered that it was based on an Iranian legend.

Tobolsk, capital of the government of the same name in Western Siberia, Russia in Asia, situated at the junction of the Irtysh and the Tobol, 1,535 miles E. by N. of Moscow. The broad regular streets, lined by well-built timber houses, are surrounded by a stone wall, and the appearance of the town from the Irtysh is picturesque. Notwithstanding its distance from the great trade route, it carries on a considerable traffic in corn, salt, fish, and timber. Pop. (1900), 21,401.

Tocantins, a river of Brazil, South America, rising in the south of the state of Goyaz and flowing mainly due northwards and discharging into the Rio Para after a course of 1,500 miles. Its chief affluent is the Araguaya, which joins it, on the left hand, at S. João das duas Barras.

Tocqueville, CHARLES ALEXIS HENRI MAURICE CLÉREL DE, economist and political philosopher, was born at Verneuil, in the department of Seine-et-Oise, France, on July 29th, 1805. He was trained for the Law and in 1831 was deputed to report on the American prison system. The work resulting from that visit was his *La Démocratie en Amérique* (1835, 1840). It ran through several editions in different languages, and brought its author many honours, including admission to the Academy in 1841. He became a deputy in Parliament, and in 1849 was Minister of Foreign Affairs. His condemnation of the *coup d'état* (1851) made him acquaint with the inside of the prison at Vincennes, and on his release he withdrew to Sorrento in Italy. His greatest work is his powerful presentment of *L'Ancien Régime et la Révolution*, which appeared in 1856, and met with unanimous eulogy. He died at Cannes on April 16th, 1859.

Todas, aborigines of the Nilghiri uplands, Southern India, now reduced to less than 1,000 in number, but presenting many points of great interest to ethnologists. They speak an uncultivated Dravidian language with Telugu and Malayalam affinities, but their physical type is not Dravidian, being distinguished by tall, robust figures, aquiline nose, retreating forehead, and an extraordinary hirsute development, with full beard, as amongst the Ainu of Japan and many natives of Australia. They are a pastoral people forming two social classes—the Peikis or "Sons of God," a priestly order, and the Katas or Tardas, all the rest.

Todleben, EDUARD IVANOVICH, general, was born at Mittau in Courland on May 20th, 1818. His father was a merchant and he was destined for

trade, but preferring a military career, he entered the Engineers in 1837. He was engaged from 1847 to 1849 in the Caucasus, superintending the operations against Schamyl. On the outbreak of the Crimean War he was occupied in the siege of Silistria and afterwards perfected the defences of Sebastopol, in which his genius had full scope and where he prolonged the siege by his resourcefulness and perseverance. In the Russo-Turkish War it was not till the Russian reverses at Plevna that his services were invoked. He saw the futility of the attempts to carry the position by storm, but by the methods of siege compelled Osman Pasha to capitulate in three months (1877). On the conclusion of hostilities he was placed in command of the army of occupation till 1879. He died at Wiesbaden on July 1st, 1884.

Todmorden, a town partly in the West Riding of Yorkshire and partly in Lancashire, England (the greater part being in Yorkshire), on the Calder, 9 miles N. of Rochdale. The chief buildings are the town hall, free endowed school and the market hall. The staple industry is the spinning and weaving of cotton, but iron-founding and engineering are carried on. In April, 1875, a bronze statue by J. H. Foley of the cotton-spinner, "honest" John Fielden (1784-1849), to whom the prosperity of the town was largely due and who played a foremost part in promoting factory legislation, was erected on the north side of the town hall. Pop. (1901), 25,419.

Toga, the distinctive mark of Roman citizenship, was an outer garment of white woollen cloth. It was elliptical in cut, about five yards in length and four in width, and was doubled lengthways in such a manner that one fold exceeded the other in depth. It was worn over the left shoulder, one extremity touching the ground in front, whilst the eleven or twelve feet which remained at the back were gathered up under the right arm and thrown a second time over the left shoulder. There were several varieties of toga. The toga prætexta, which had a deep purple border, was worn by the children of the nobles, by girls till marriage, and by boys below the age of fourteen. The toga virilis, or manly robe, was worn by boys when they reached the age of fourteen. It was assumed also by magistrates *ex officio*, priests and persons fulfilling vows. The toga picta, richly adorned with Phrygian embroidery, was donned by high officials on particular State functions.

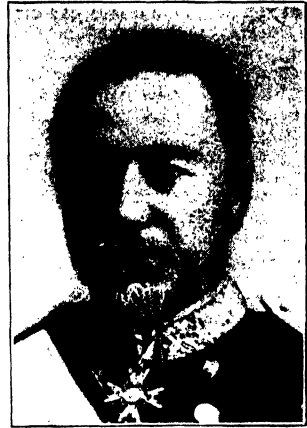


Toga.

Togo, HEIHACHIRO, admiral, was born in Japan in 1847. He entered the naval service of his country, for which he had been fully trained in England on H.M.S. *Worcester* and at the Naval College, Greenwich (1873-4). He commanded the cruiser *Nanina* in the China-Japan War (1894), when he sank the Chinese transport *Korshing*. He

was promoted Rear-Admiral in 1895 and Vice-Admiral in 1900. On the outbreak of the war with Russia in 1904, he was placed in chief command of the Japanese fleet, with the rank of full Admiral, effectively blockaded Port Arthur and broke the maritime power of Russia in Far Eastern waters on May 27-28th, 1905.

Togoland, a German possession in West Africa, on the Slave Coast, Upper Guinea, bounded on the W. by the Gold Coast Colony, on the E. by Dahomey, on the S. by the Gulf and



ADMIRAL TOGO.

running northwards to 11° N. It occupies an area of about 33,700 square miles. The coast-line measures 32 miles in length, but inland the territory (which roughly lies between the Volta and the Mono) at parts has three or four times that width. The coastal climate is unhealthy, but the hilly interior is much more salubrious. Maize, yams, ginger, tapioca, bananas, coffee, cocoa, kola, manihot, tobacco and cotton are cultivated. In the forests palms, oil-palms, caoutchouc and dye-woods occur, and a flourishing trade is done in palm oil, palm kernels and gum. Cattle, sheep, goats, pigs, poultry and horses are raised in parts. Iron is worked by the natives, whose other industries include weaving, pottery, wood-cutting, smith's work and straw-plaiting. Lome, the chief port, is the capital. The territory was acquired by Germany in 1884 and is administered by an Imperial Governor, assisted by a small local council and certain officers. Pop. (estimated), 950,000, of whom only some 300 are European.

Tokay (Hungarian, NAGY TOKAJ), a town of the county of Zemplin, Hungary, at the confluence of the Bodrog and Theiss, 130 miles N.E. of Budapest. The wine of the name is grown on the volcanic mountain in the neighbourhood, but much of the so-called "Tokay," whether imported from the district or not, is an artificial concoction. The town was burnt down in 1890. Pop. (1900), 5,110.

Tokyo, formerly called YEDO, the capital of Japan, is situated on the south-eastern coast of the island of Nippon or Hondo, at the head of the bay of the same name. The town occupies a broad, fertile plain watered by the river Sumida, but some of the districts (*ku*) are hilly, rising to a height of 100 feet above the general level. The

lower quarters are traversed by a network of canals, crossed by numerous bridges, which form a characteristic feature. On either side of this district are the large and beautiful parks of Shiba and Uyeno. The latter park and the Mukojima, an embankment extending for five miles along the river, are famous for their cherry-trees, which in spring-time render them favourite promenades. The Imperial Palace is an imposing building in Japanese style, surrounded by lofty walls and broad moats. Many of the old residences of the *daimyos* (territorial lords) may still be seen standing in the midst of their large artificial gardens, but others have been replaced by Government offices or new streets of brick houses. The principal buildings include the Imperial Palace, the Russian Cathedral, the Imperial University (one of the most influential educational bodies in Eastern Asia), the museum, library, observatory, Government offices and legations and several beautiful temples, especially the famous Ekoin. Pop. (1903), 1,818,655.

Toland, JOHN, Deist, was born at Inishowen, near Londonderry, Ireland, on November 30th, 1670. He went to school at Redcastle, and afterwards studied at the universities of Glasgow, Edinburgh and Leyden and then spent some time at Oxford. He became notorious by his *Christianity not Mysterious* (1696). Orthodox zealots persecuted him and he was reduced to writing for the booksellers to earn a living. Thus he edited John Milton's prose works (1698), the *Memoirs of Denzil, Lord Holles* (1699) and James Harrington's *Oceana* (1700). He had further embittered the feelings of the religious community by his *Amyntor* (1699), reciting a number of so-called Christian writings which, he alleged, were spurious. During the latter part of his life he was occasionally employed as a political hack, in which capacity he produced *Anglia Libera* (1701), a defence of the Succession Act; *The Memorial of the State of England* (1705); *The Art of Restoring* (1713), in which Lord Oxford was accused of a desire to emulate Monk; *The State Anatomy of Great Britain* (1717), which elicited an answer from Daniel Defoe; besides several pamphlets against Jacobites and High Churchmen. He offended against orthodoxy once more by his *Nazarenus* (1718) and *Tetradymus* (1720), dealing with various subjects of Church history in a free-thinking spirit. He died at Putney on March 11th, 1722.

Toledo, capital of the province of the same name, Spain, on the right bank of the Tagus, 40 miles S.S.W. of Madrid. It is situated on a group of seven granite hills, 2,400 feet above the sea. Towards the north, the only side on which it is not surrounded by the Tagus, there are inner and outer stone walls, dating respectively from the 7th and 12th centuries, both of which contain several handsome old gates. The houses which line the steep, silent and gloomy streets are mostly Moorish in style. The magnificent cathedral, mainly Spanish Gothic with a semicircular apse, contains some beautiful Flemish stained glass of the 16th

century, and the numerous side-chapels are very elaborately ornamented. The Alcazar, the ancient palace of the Gothic kings, rebuilt by Charles V. and Philip II., was nearly destroyed by fire in 1887, but has been restored and is now the Academy for Infantry. The manufacture of the famous Toledo swords is still carried on. Toledo, the Roman *Toletum*, was the capital of the Visigothic sovereigns. It was occupied by the Saracens and Moors from 714 to 1085, when it became the capital of Castile and Leon. Pop. (1900), 23,375.

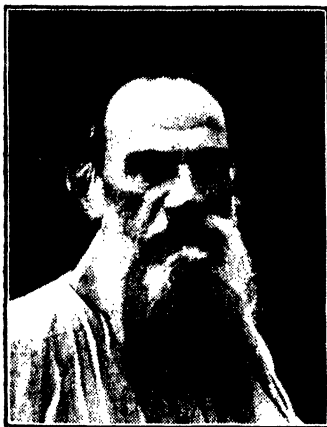
Toledo, the capital of Lucas county, Ohio, United States, on the Maumee, about 4 miles from the south-western shore of Lake Erie and 100 miles W. by N. of Cleveland. The principal buildings include the public library, court-house, Toledo Medical College and St. John's College, besides the Zoological Garden in Walbridge Park and the Soldiers' Memorial. The industries comprise iron-founding, engineering, the making of bicycles, agricultural implements, motor-cars, carriages and waggons, lumber products, petroleum-refining, flour-milling, tobacco-making, brewing and distilling, and shipbuilding. It is an important centre of communication, connecting with the interior by means of the Miami and Erie Canal and being the natural port for the grain and lumber produce and coal and iron of the North Central States. Pop. (1900), 131,822.

Toleration Act, an Act of the English Parliament passed on May 24th, 1689, relaxing the stringent conditions of the Act of Uniformity, the Five Mile Act, and the Conventicle Act. Freedom of worship was now secured for those who would take the oath of allegiance and subscribe the declaration against Popery, but Dissenting ministers were required to subscribe the Thirty-nine Articles, excepting three and part of a fourth. Quakers were exempted from these conditions. The benefits did not extend to Roman Catholics, Unitarians, or Deists.

Toll, an old term for a tax in general, but restricted in later times to the payment exacted in return for a privilege. Market-tolls, raised by the owners of the land, were formerly common, but the only tolls known in recent times have been those collected on roads and other accommodations for transport. Toll-bars on roads were generally abolished in England in 1889, but the system is still maintained on piers, and to some extent on bridges also.

Tolstoy, COUNT LEO NIKOLAEVITCH, novelist and social reformer, was born at Yasnaya Polyana, the family estate near Tula, Russia, on August 28th, 1828. He was educated privately and at the University of Kazan, where he acquired little or nothing of book-learning, but amassed a fund of experiences of various kinds useful to him later. Having been discouraged from the pursuit of Eastern languages and law and having almost a contempt for history, he entered the army, was present at the siege of Silistria, and took an active part in the defence of Sebastopol. In these exciting times he came to loathe warfare and gave

up militarism for literature. After his retirement from the army, he visited Germany and Italy, and finally settled down on his estates, working with his own hands among his tenants, whose life he endeavoured fully to share. He established peasant schools and promoted education on an intelligent basis, attaching importance to manual labour and what was actual. From 1885 to 1895 he was engaged in plans for the dissemination of popular publications at cheap prices, though his efforts were suspended in 1891-2 whilst he organised relief for the starving people of Middle Russia. In 1895-6 he startled the world by renouncing pro-



COUNT LEO TOLSTOY.

(Photo : Scherer, Nahlolz, Moscow.)

perty in copyright, land and money, and was excommunicated by the Holy Russian Synod on February 22nd, 1901—a decree which he no doubt anticipated. In religion he might be described as a Unitarian with an intense faith in the humanity of Jesus and a conviction that the sincere working out of the Sermon on the Mount was the only reverent as well as possible meaning of the term "Christianity." Public prayer being expressly forbidden by Jesus, churchgoing he held to be little more than a convention, though private prayer was the sole way to foster the growth of love. Amongst his books may be named *Childhood* (1852), *Boyhood* (1854), *Youth* (1855-7), *The Cossacks* (1863), *War and Peace* (1864-9), *Anna Karenina* (1873-8), *The Death of Ivan Ilyitch*, *The Power of Darkness* (1885), *My Confession* (1879-82), *Kreutzer Sonata* (1890), and *Resurrection* (1900).

Toltecs, or TULTECS, a historical people of Nahuatl stock, Mexico, who, according to the national traditions, flourished from the 6th to the 11th century, when their power and culture were destroyed by the irruption of the barbarous Chichimecs. During the Toltec period the Nahuatl civilisation reached the high-water mark of excellence, so much so that the term *toltecatl* afterwards became synonymous with artificer or builder,

and to the Toltecs were attributed all the great monuments of the Mexican plateau and many even of Central America. Hence it has been argued that there never was a Toltec people at all, and that the word originally designated nothing more than the first and most flourishing epoch of Nahuatl culture before the centre of their power was removed from Tollan (Tula), 50 miles farther south to the site of the present city of Mexico. There was also a Tula in Nicaragua founded by the Nahuatl Toltecs, who took refuge in Central America, and for a time revived the glories of the old Toltec state after its overthrow by the Chichimecs. The Toltecs are said to have possessed vast libraries of pictorial writings, destroyed by their Aztec descendants, who were jealous of the glory of their renowned predecessors.

Tolu Balsam is a thick yellow or brown liquid obtained from *Myroxylon toluiferum*, an evergreen tree found in the upland districts of the United States of Colombia, Tolu or Santiago de Tolu, being a port on the eastern coast of the Gulf of Darien. It dries to a hard, yellow transparent solid, which, like the liquid balsam, possesses a fragrant, agreeable odour. It contains benzoic and cinnamic acids, together with derivatives of these compounds and resinous substances. It is used slightly in medicine as a stimulant and pectoral.

Toluene (C_6H_5) is a hydrocarbon which is derived from benzene by the replacement of one of the hydrogen atoms by the group CH_3 . It is a liquid which in most of its properties closely resembles benzene. It boils at 110° and has a specific gravity of 0.88. By oxidation it is converted into benzoic acid. It occurs in, and is chiefly obtained from, coal-tar, and is also a product of the distillation of Tolu Balsam and other aromatic compounds.

Tomato, or LOVE-APPLE (*Lycopersicon esculentum*), an annual herbaceous plant, native to South America and probably Mexico. It belongs to the order Solanaceae, and has been cultivated in Europe, for the sake of its wholesome fruit, since the beginning of the 16th century. It has irregularly pinnate leaves; extra-axillary, many-flowered inflorescences; connate anthers dehiscing by longitudinal slits; and polished, scarlet or yellow, many-seeded fruits. The flowers are often fasciated so as to produce a many-chambered, irregularly-lobed fruit; but two varieties in which there are only two carpels, *L. cerasiforme*, with a round, cherry-like fruit, and *L. c. pyriforme*, pear-shaped, have sometimes been considered specifically distinct. The consumption of this valuable acidulous fruit in the United Kingdom is on the increase. It will not always ripen out of doors in Great Britain, but large quantities are grown under glass, in addition to the much larger quantities imported into the country, both fresh and in tins, from America and the Continent. It is eaten raw in salad, cooked with meat, or as a sauce or ketchup. In a temporary panic it was gravely asserted that cancer was caused by the use of the tomato, a rumour so intrinsically absurd that it is difficult to imagine how it came to acquire even a moment's credence.

The alternative name of "Love-Apple" comes through the French "Pomme d'Amour," which in turn is a corruption of the original Italian name "Pomo dei Mori," the plant having reached Italy by way of Morocco and being therefore designated the "Moorish Apple."

Tombac, an alloy of copper and zinc, but with a much greater quantity of the latter metal than is present in ordinary brass. It is a yellow, tough alloy, which may be whitened by the addition of nickel or arsenic. It is sometimes known as Prince's metal and Mannheim gold.

Tomicus, a genus of bark-beetle, of the family Scolytidae, which burrows under the bark of trees. By preference they bore the wood of the elm, ash, oak, poplar, conifers and fruit trees. Their ravages have caused considerable destruction in the forests of France and Germany. They convert some trees into little more than shells, which topple over at the earliest storm.

Tomsk, capital of the government of the same name, West Siberia, Russia-in-Asia, on the right bank of the Tom, a tributary of the Ob. The chief buildings are the cathedral, university, library, technological institute, school of mines, veterinary college, mosque, synagogue and several scientific and charitable institutions. The industries are distilling, tanning and the making of candles and matches, but the place is of far greater importance as a distributing centre. A branch line connects it with Taiga, on the Trans-Siberian Railway. Pop. (1900), 63,533.

Ton is the same word as "tun," and may have been derived, through the Latin, from a Greek word denoting a vessel for wine, or may be merely derived from the verb *tyman*, "to enclose." The word exists under different modifications in most European languages. The ton is a mass of 20 cwt. or 2,240 lbs. in the United Kingdom, but in some places the hundredweight is reckoned as only 100 lbs., which reduces the ton to 2,000 lbs. The tun was long used as a measure of wine and beer; in the case of the former it consisted of 252 gallons, while a tun of beer held 216 gallons. The gallon itself, however, varied in the two cases, so that the curious result was obtained that a tun of beer was actually a greater volume than a tun of wine. These measures are now only used for the sake of convenience, the standard gallon being the highest legal measure of volume.

Tone, THEOBALD WOLFE, one of the leaders of the United Irishmen, the son of a coachmaker, was born in Dublin on June 20th, 1763. He studied at Trinity College and, after being called to the bar in 1789, gave himself up to political intrigue in connection with the Catholic Committee. On account of his complicity in the United Irishmen organisation he was obliged to go to the United States in 1795. Thence he undertook a mission to France in order to get French help for them and himself served under Hoche. In 1798, having been captured on board a French vessel, he was condemned to death, but anticipated his fate by strangling himself on November 19th. An edition of his *Auto-*

biography, under the competent editorship of Richard Barry O'Brien, appeared in 1903.

Tongking, or TONGKIN ("Eastern capital"), a French possession in Indo-China, bounded on the N. by the Chinese provinces of Kwangsi and Yunnan, on the E. by the Gulf of Tongking, on the S. by Annam, and on the W. by Laos. It covers an area of 46,400 square miles. The leading products are rice, sugar, silk, cardamoms, cotton, coffee, tobacco and fruit. The industries include silk-weaving and cotton-spinning. Copper, iron, coal and salt are the principal minerals. The territory was annexed to France in 1884. Hanoi (150,000), the chief town, took the place of Saigon as capital of Indo-China in 1902. Pop. (estimated), 10,000,000, including 33,000 Chinese and 4,000 Europeans.

Tongue. The tongue is mainly composed of muscular tissue, and is covered with mucous membrane, which presents a remarkable development of the structures known as papillæ. These papillæ are of three kinds—the circumvallate papillæ are situated in two V-shaped lines at the base of the tongue, and consist of eight or ten rounded elevations, each of which has a central depression; the fungiform papillæ are distributed mainly over the tip and sides of the tongue; the filiform papillæ, simple conical elevations, are numerous distributed over the whole surface of the tongue. The tongue is possessed of ordinary sensibility, and contains the nerve terminations concerned with the special sensations of taste; it plays, moreover, an important part in the modification of speech sounds and in the muscular actions of mastication and swallowing. It is also a ready means of diagnosis in certain kinds of disease. In stomacheal complaints it is furred (that is, white and dirty); in prostration it is dry and black, in thrush it is covered with white curdlike patches; in diabetes it is red, dry and glazed; in scarlet fever its bright red dry condition is known as "the strawberry tongue." In a healthy state it should be clean and moist.

Diseases of the Tongue. The mucous membrane of the tongue is apt to be affected by inflammation or glossitis, and in this form of disease the deeper parts of the tongue are sometimes involved, leading, it may be, to abscess formation, or, in rare instances, to permanent hypertrophy of the organ. This condition may be usefully treated with a warm mouth-wash, to which has been added chlorate of potash, 10 grains to the ounce, and by the external application of a hot fomentation or poultice. Till the inflammation subsides, the patient's diet should consist of warm fluid (milk and water or beef-tea). White patches are sometimes met with on the surface of the tongue, a condition known as leucoplakia. Ulceration of the tongue occurs in connection with digestive disturbance and with syphilis, or from the irritation caused by the sharp edge of an injured tooth. A warm mouth-wash of 15 grains of boracic acid and 15 grains of tincture of myrrh to the ounce of water; or of 10 grains of chlorate of potash and 15 grains of boracic acid to the ounce of water employed at pretty frequent

intervals will afford relief. The tongue is an organ which is not uncommonly affected by the form of cancer known as epithelioma.

Tonics are remedies which favourably influence the nutrition of the body, improving appetite and digestion. Change of air, exercise, and baths are among the most valuable tonic remedies. Certain drugs possess tonic properties, either in virtue of their action upon the digestive system, as in the case of calumba, gentian, quassia, and the like, or by their influence in improving the condition of the blood (preparations of iron having a remarkable influence of this kind), or by their general effect as "alteratives" and general tonics, producing improvement of nutrition, such as is manifested on the exhibition of remedies like cod-liver oil, arsenic, or quinine.

Toning. The photographic prints obtained upon the ordinary silver paper of photographers have neither a permanent nor pleasing colour, and have therefore, before fixing, to be subjected to a process known as toning. This is usually effected by immersing the prints for some time in a bath containing a solution of chloride of gold and other salts, e.g., sodium acetate or borax. The colour of the print is seen to alter and pass through a series of colours from brown to a deep purple, the paper being taken out when the desired tone is obtained. The exact tone obtainable, however, varies with the paper and the composition of the toning-bath, and a considerable amount of experience is required to obtain the best results. The prints are afterwards washed and fixed by immersing in a solution of sodium thiosulphate. The exact chemistry of the process is still a matter of some uncertainty. It is usually regarded as dependent on a substitution of gold for the silver of the image. Many other solutions, however, may be used for toning, as solutions of platinum, ammonium sulphide, iron, etc., and it may be due, in some cases, to an alteration of the molecular state of the silver deposit.

Tonka Bean, corrupted into **TONQUIN BEAN**, the seed of the leguminous *Dipterix* (*Coumarouna*) odorata, a large tree native to Cayenne, Venezuela and adjoining regions. Both fruit and seed resemble those of the almond, but the seed is longer, black and polished. It contains a crystalline aromatic substance, coumarin ($C_9H_6O_2$), which has the scent of new-mown hay. It is used to scent snuff and in the manufacture of sachets and perfumes, for which purpose it is imported from Para, Angostura and Surinam. Many snuff-takers carry a bean in their boxes, the aroma being supposed to lend an additional flavour to the snuff.

Tonnage, a measure for determining the cubical capacity and carrying-power of ships and thus estimating the dues on shipping. The "register" ton now in use was enforced by the British Merchant Shipping Act of 1854, amended in 1862 and 1867, and has been adopted by various foreign countries. It is equivalent to 100 cubic feet of space, so that a vessel with an internal volume of 100,000 cubic feet is 1,000 tons register. The Act makes pro-

vision not only for ascertaining the depth of a ship in addition to its length and breadth, but for taking into account the curvature of the hull by means of cross-measurements at various points. A deduction is made for crew-space and, on steamers, for the engine-room, boilers, etc. On the other hand, the poop and other closed-in spaces above the upper deck available for stowage are added to the "nett register" tonnage.

Tonsillitis (**QUINSY**). Inflammation of the tonsils often results from exposure to cold or wet, and when the tendency to this form of mischief becomes developed in early life the disease is apt to recur from time to time. An attack of tonsillitis is usually ushered in by marked febrile disturbance, and the temperature may attain a considerable degree of elevation. One or both tonsils become swollen, there are marked difficulty in swallowing and tenderness behind the angles of the jaw, the tone of the voice is altered, and there may be deafness. Sometimes a collection of matter forms in the substance of the tonsil, and in such cases the symptoms are very distressing to the patient until such time as the abscess bursts. The treatment of tonsillitis consists in maintaining rest, giving nutritious liquid food, causing the patient to gargle (in the early stages with warm milk or black-currant tea, later with some form of a stringent gargle) and administering tonics. During convalescence it is important that a liberal diet should be administered, and port wine may often be taken with advantage. In cases where the tonsils become permanently enlarged as the result of repeated attacks of inflammation, it is usually advisable to have the hypertrophied structures removed.

Tonsils. The tonsils are situated one on each side of the throat between the anterior and posterior pillars of the fauces. Each tonsil consists of a collection of adenoid or lymphoid tissue, and is covered with a mucous membrane, which presents a number of orifices leading into recesses called the crypts of the tonsil. In the case of some children, otherwise healthy, a condition of enlarged tonsils occasionally obtains. At first, beyond a slight difficulty in swallowing and a muffled utterance, no trouble is experienced; but with age these symptoms become accentuated, the proper distension of the lungs is hindered and the chest may acquire the narrow "pigeon-breast" character, the youth assuming a somewhat vacant look and generally going about with the mouth agape. Local treatment is of no avail and the doctor should be allowed to excise the enlarged tonsils. The operation is simple and causes little pain, while the bleeding that may ensue can be readily checked.

Tontine, a society formed for raising money for some definite purpose, the lenders receiving interest for their loan, and an indefinitely increasing interest in proportion to those who survive the other members of the society. In this latter respect a tontine somewhat resembles a lottery, though some hold that it is no more a lottery than

is an ordinary assurance society. But in the case of an assurance society the death of the assured is certain, the only element of chance being whether the assured can keep the premium paid, and how many premiums he has to pay before his representatives become entitled to the sum assured; whereas in the case of a tontine the increase of income is altogether a matter of chance in any particular case. The name is derived from a Neapolitan banker named Lorenzo Tonti, who settled in Paris, and in the year 1653 proposed to raise a huge loan for the national exchequer upon a new principle. His idea was to issue 300-franc shares and to divide the subscribers into ten classes—*i.e.*, those under 7 years of age, those from 7 to 14, 14 to 21, etc. Each class was to divide a fixed proportion of interest among its members and, as the members of a class died off, the survivors became entitled to all interest due to the class; and upon the death of the last member of the class the profits of that class passed to the State. This scheme fell through, partly through national prejudice against Tonti and his patron Mazarin, who were both Italians; but in 1689 Louis XIV. established a tontine to last 40 years, and in 1736 the last survivor was drawing 73,500 francs as interest upon her 300-franc share. Many such societies have been started in France, and the principle has been introduced into Great Britain and Ireland. In the United States it has also been popular. The principle has been applied to the formation of clubs, the survivors becoming proprietors.

Tooke, JOHN HORNE (whose real name was JOHN HORNE), politician and philologist, was born in Westminster on June 25th, 1736, and educated at Westminster School, Eton and St. John's College, Cambridge. He was entered at the Inner Temple in 1756 but, at his father's behest, took holy orders and was ordained in 1760. Having made the acquaintance of John Wilkes, he began to take an active part in politics, and in 1773 resigned the living of New Brentford. He was imprisoned (1778) for getting up a subscription for the Americans who fell at Lexington, and in 1791 was tried for high treason but acquitted. In 1801 he obtained a seat in Parliament for the rotten borough of Old Sarum. In 1782 he adopted the name of Tooke, having been hitherto known as "Parson Horne," and frequently resided with his friend, William Tooke, at Purley, near Croydon, in Surrey. He died at Wimbledon on March 18th, 1812. His *Diversions of Purley* (1786, 1805), amongst its other contents, has the best philological work of the 18th century.

Toole, JOHN LAWRENCE, actor, was born in London on March 12th, 1832. Having played successfully in the country, he made his *début* at the Haymarket Theatre, London, in 1852. He was afterwards connected with the Lyceum, the Adelphi, the Queen's, and the Gaiety theatres in the metropolis, besides repeatedly touring in the provinces of the United Kingdom, where he was a special favourite. In 1879 he acquired the Folly Theatre in London (which in 1882 he named Toole's Theatre), and retired from the stage in 1895. He died at Brighton

on July 30th, 1906. By will he generously provided for several of the charitable institutions connected with his profession, and left numerous souvenirs to Sir Henry Irving, who predeceased



J. L. TOOLE.

(Photo: Warwick Brookes, Manchester.)

him, and many friends. He began his career as an exponent of low-comedy parts "with songs" (in which he excelled), but afterwards developed a turn for pathos, well felt in such *roles* as "Caleb Plummer" in *The Cricket on the Hearth*, "Michael Garner" in *Dearer than Life*, and "Uncle Dick" in *Uncle Dick's Darling*. In the older comedy he was seen to great advantage in such parts as "Paul Pry" and "Dennis Balgruddery" in *John Bull*. He revelled in extravaganzas and parody, but that he was equal to satisfying the modern taste he proved by creating the part of "Jaspar Phipps" in J. M. Barrie's *Walker, London*, which was produced at Toole's Theatre on February 25th, 1892.

Tooth, Toothache. [TEETH.]

Tooth-Shells, the shells belonging to the class Scaphopoda, of which the genus Dentalium is the only well-known form. Cadulus and Siphonodentalium are two other living genera, the latter of which dates back to the time of the Chalk.

Topeka, the capital of Shawnee county and of Kansas, United States, on the Kansas, 67 miles W. of Kansas City. It is situated in a fine prairie region at a height of nearly 900 feet above the sea. The principal buildings are the Capitol, Government House, court-house, town hall, Grace Church Cathedral, Washburn College, the College of the Sisters of Bethany and the Kansas Medical College. It has flour-mills, woollen factories, iron-foundries, railway works and machine-shops and meat-packing establishments. Pop. (1900), 33,608.

Toplady, AUGUSTUS MONTAGUE, divine, was born at Farnham, Surrey, England, on November 4th, 1740, and was educated at Westminster

School and Trinity College, Dublin. He was ordained in 1762 and in 1768 obtained the living of Broad Hembury in Devonshire, which he held till his death in London on August 14th, 1778. In his last years he ministered to the French Calvinist Reformed Church in London. His writings include *Poems on Sacred Subjects* (1759) and *The Historic Proof of the Doctrinal Calvinism of the Church of England* (1774). His writings were disfigured by frequent unseemly attacks (not wholly unprovoked, however) on John Wesley. His fame rests on his beautiful hymn "Rock of Ages cleft for me," which first appeared in the *Gospel Magazine* for October, 1775.

Top-Shells, the members of the family Trochidae. They are small univalve shells, which are largely used for ornamental purposes, as the shell is composed of nacreous material which appears pearly when the outer layer is removed by acid. The type-genus *Trochus* ranges from the Silurian period to the present day.

Tormentil (*Potentilla Tormentilla*), a* very common trailing-plant found on heathy ground in Europe and the temperate regions of Asia, with quinate lower leaves, ternate upper ones, and four yellow petals. Its highly astringent root is sometimes used in medicine and tanning, and also yields a red colouring matter which the Lapplanders employ to dye their sheepskin clothing. The plant is said to have acquired its name from its use as a soother of the pain or torment of toothache.

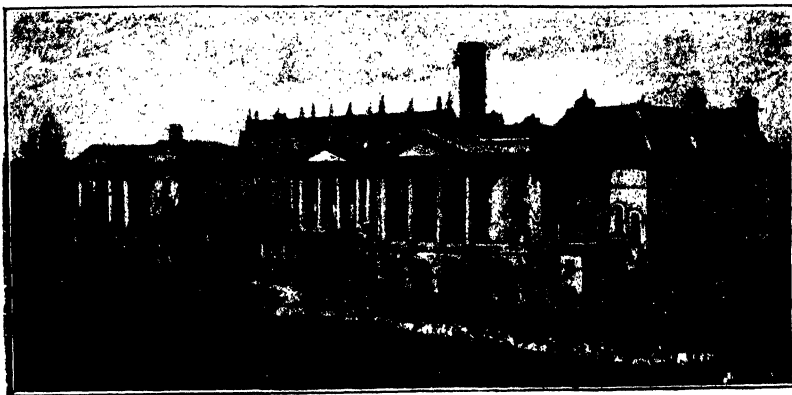
Tornado is a local disturbance generally extending over a small area, but exceedingly destructive and generally accompanied by violent hailstorms, thunder, or waterspouts. Tornadoes are by no means all equally violent, but all—even the mildest—are characterised by a rotatory motion, hence the name tornado. When at any time the atmosphere at any spot is in a state of instability and a stream of hot air from below forces its way through the cool layers above, we have the possibility of a tornado. The place of the rising stream is filled by air rushing in from all surrounding parts, and a vertical circulation will continue so long as the initial cause of the instability is maintained. The vertical motion may extend for several miles in height, but the horizontal effect is seldom felt over a distance of more than half a mile. The temperature of the rising current exceeds that of the air immediately surrounding it, and its pressure is proportionately less; if the cause of the disturbance reaches high altitudes, the excess of temperature of the rising over the surrounding air increases, and the vertical circulation extends to a great height. A certain point, however, will be reached by the ascending current, where its temperature will become equal to that of the air outside it; and if the vertical circulation were the only active motion, the pressure of the two portions of the atmosphere would also be equal there. Up to this point a constant impetus has been given to the ascending current, owing to its density being less than that of its neighbouring fluid. Conse-

quently the velocity has increased, but with a diminishing acceleration. Above this level, however, the rising current becomes denser than the air around it, and therefore its upward velocity is retarded. It meets, as it were, with a resistance to its passage, and consequently often spreads out horizontally on all sides. It is seldom, however, that the air surrounding this vertical disturbance has been perfectly free from motion, and the slightest rotatory movement in the in-rushing air at the base of the column is sufficient to produce a gyrotory circulation in the whole uprising stream. A spinning column of air is thus produced. The whirling of the air has an enormous effect on the pressure, and causes it to be extremely low in the centre of the tornado, while it rises rapidly towards the outside. This causes many curious effects in the passage of a tornado. The door of a closed room is suddenly confronted with the centre of the column; the pressure on the outside of the door is therefore suddenly diminished, but the air inside exerts its pressure as usual, and the result is that the door is burst open outwards. In the same way the walls of feeble houses are projected prostrate on the ground. Windows burst and leap from their frames, while the lid of a box will suddenly rise upwards as though gravitation had stopped. At the base of the rotating column friction with the earth's surface greatly diminishes the gyrotory motion; hence centrifugal force does not make these warmer particles rush outwards sufficiently forcibly to prevent the entrance of the surrounding air. Higher up, however, friction has little or no power. The rotating particles push back the outside air, and thus form an impenetrable wall for the whirling pillar. This naturally increases the force of the inrush from below, and places enormous power in the possession of the ascending current. Pieces of timber, weighing several hundred pounds, have been lifted above the houses for a quarter of a mile. Trees have been wrenched up by the roots, horses and waggons lifted into the air, houses turned about, engines overturned, and rails torn up from the ground, while even the wool and feathers of living sheep and birds were not insignificant enough to elude the vigilance of this devastating monster. Tornadoes are specially violent in the United States and the Signal Service has published exhaustive and interesting accounts of many of them, Paper No. 4 by Lieutenant Finley dealing graphically with the fearful results in Kansas, Nebraska, Missouri and Iowa caused by the memorable tornado of May 29th and 30th, 1879. The reader is referred to Ferrel's *Popular Treatise on the Winds* for further information concerning this phenomenon.

Toronto, the capital of the province of Ontario and second city of Canada, situated at the mouth of the Don on the north-western shore of Lake Ontario, 333 miles S.W. of Montreal. It stands on a large bay sheltered by a sandy peninsula, 6 miles in length, which forms an excellent harbour. The principal buildings include the provincial Parliament House (1888-92), the Romanesque City hall and court-house (1900), Government House, Osgoode Hall (seat of the superior courts

of Ontario), St. James's Cathedral, the Cathedral of St. Michael, the Metropolitan Methodist Church, the Free Public Library, and the University of Toronto (established in 1827 as King's College,

of the former class consists of an iron vessel containing from 30 to 500 lbs. of explosive, either moored so as to float some 10 feet below the surface, or resting on the bottom. A mine may



OSGOODE HALL, GOVERNMENT HOUSE, TORONTO.

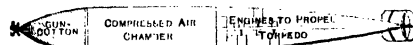
(By permission of the Canadian Government.)

burned down in 1890 and since rebuilt), besides many other educational and charitable institutions. The city contains a fine art school and gallery and in Miss Edith E. Shaw possesses an illuminator whose skill and taste recall the superb qualities of the ancient writers of missals. Queen's Park, Riverdale Park, the Exhibition Grounds and the Horticultural Gardens are the leading parks and recreation grounds. The manufacturing establishments comprise iron-foundries, steel-works, engineering works, rolling-mills, breweries, distilleries, factories for the making of railway plant, carriages, waggons and agricultural implements, meat-packing houses and shipbuilding. Toronto is the natural outlet for the produce of the province and its commercial relations are therefore conducted on a scale of considerable magnitude. In 1793 its site was occupied by a single wigwam, and the population increased from less than 10,000 in 1834 to 208,040 in 1901.

Torpedo, a genus of Batoid fishes, the type of the family Torpedinidæ, containing the Electric Rays. *T. hebetans* occurs on the south coast of England, as well as in the Mediterranean and the adjacent parts of the Atlantic. When a torpedo is grasped by the hand, a creeping sensation is communicated to the whole limb as far up as the shoulder, along with a violent tingling and sharp pain at the elbow. The electric properties, which give a shock strong enough to kill a duck, cease with life.

Torpedo is an appliance for exploding a charge of gun-cotton or dynamite near a vessel, and may be fixed—in which case it is usually known as a submarine mine—or may be provided with some means for propelling it in any direction. A torpedo

be arranged to explode when struck by a ship, or may be controlled electrically from the shore. In the latter case the firing key, which closes the circuit and explodes the charge, must be pressed



SECTION OF A WHITEHEAD TORPEDO.

when the ship is over the mine, and to ascertain when this moment arrives two sights or telescopes are arranged so that the lines of vision of two observers cross at a point over the mine; when the ship is sighted by both observers it is known to be



TORPEDO FISH.

in the desired position. In some cases a current from a battery on shore is taken by an insulated wire to the mine, and the circuit is automatically closed when the mine is struck by a vessel, while

the safety of friendly ships may be secured by disconnecting the battery on shore. Of the numerous types of locomotive torpedoes, the Whitehead is one of the best known. It is practically a submarine boat shaped like a cigar, and from 12 to 19 feet in length. It is propelled by a three-cylinder engine, supplied with compressed air from a chamber provided for that purpose. The nose of the torpedo contains a charge of from 30 to 100 lbs. of gun-cotton, and is provided with a mechanical arrangement for exploding it on contact with the side of a ship. By means of a secret piece of mechanism, two horizontal rudders adjust themselves so that the torpedo maintains a fixed distance below the surface; it can travel 2,000 yards at a speed of 28 knots, or 1,100 yards at a speed of 31 knots. At the same time the effective range is generally fixed at 800 yards.

Torquay, a watering-place of Devonshire, England, on the northern shore of Tor Bay, 23



TORQUAY.

(Photo: Poulton & Sons, London.)

miles S. of Exeter. The pleasant alternation of hill and valley and the abundant and luxuriant foliage which relieves the streets and terraces give it a very picturesque appearance. Owing to its mild and equable climate it is much frequented by consumptive patients, especially during the winter months. The harbour is usually crowded with yachts. There are marble and terra-cotta works of some repute in the vicinity. There are the remains of the Premonstratensian abbey of Torre, founded in 1196. The principal buildings are St. Saviour's (restored, 1874), St. Mary's (rebuilt in the Early Decorated), and St. John's (a good example of modern Gothic by G. E. Street), the town hall, museum of natural history, the schools of art and science, besides numerous charitable institutions. William, Prince of Orange, effected his memorable landing at Tor Bay in 1688. Pop. (1901), 33,625.

Torque, a kind of bracelet or armlet, generally of gold, and often formed of a spirally-twisted bar or bars, ending sometimes in hooks, sometimes in serpents' heads. They were greatly in use in

ancient times in Asia and in Northern Europe, and the Romans adopted the practice of wearing them after their contact with Celtic and Oriental races. Specimens have been dug up in many places, as well in the United Kingdom as abroad.

Torquemada, TOMAS DE, the first head of the Inquisition in Spain, was born at Valladolid, in 1420. Before his appointment in 1483 as Inquisitor-General, he had been a prior of a Dominican house at Segovia. He covered himself with eternal infamy by the horrible atrocities of his sway. It appears incredible, but it is asserted that he burned 6,000 Jews at Saragossa, while his Spanish victims have been estimated at 8,000. He died at Avila on September 16th, 1498.

Torricelli, EVANGELISTA, mathematician and natural philosopher, was born at Faenza, Italy, on October 15th, 1608, and educated by the Jesuits. In 1641 he was appointed mathematician to the Grand Duke of Tuscany in succession to Galileo. From his discoveries in connection with the barometer that instrument has been called the Torricellian tube, and its vacuum the Torricellian vacuum. He also laid down the primary principles of hydromechanics, and made many discoveries in pure mathematics. His *Trattato del Moto* ("Treatise on Motion") appeared about 1641. He died at Florence on October 25th, 1647.

Torridon Sandstone, a series of reddish and chocolate-coloured sandstones, at least 8,000 feet thick, resting nearly horizontally upon the Archaean gneisses near Loch Torridon in Ross-shire, Scotland, and apparently of Cambrian age.

Torsion is the strain set up in a rod or wire when one end is twisted with regard to the other. By considering the relative positions of two adjacent sections of a bar before and after twisting, it is clear that this strain is a shear strain. If a twisting movement or torque be applied to one end of a bar, whose other end is fixed, it is found that the twist produced is proportional to the torque, provided the limit of elasticity be not exceeded. In the case of bars of the same material and section but of different lengths, the twist for the same torque is proportional to the length; and in round bars of the same length, but of different diameters, it is inversely proportional to the fourth power of the diameter. In the case of bars or wires of the same length and diameter, but of different materials, the twist produced by a given torque is inversely proportional to the modulus of rigidity of the material—that is, to the ratio of the shear stress to the shear strain produced. The twist produced by a given torque applied to bars of different shapes depends upon the section. The fact that the angle through which the free end of a wire is twisted is proportional to the torque affords a convenient means of measuring twisting forces, and is used in a variety of instruments, such as the torsion balance, by means of which Cordoub investigated the laws of electric and magnetic attraction. A little consideration will show that when an ordinary spiral spring is altered in length, the wire of which it is made is subjected to torsion, and such a spring

obeys the same laws as a twisted wire, due allowance being, of course, made for the diameter of the mandrel on which it is wound.

Torsk (*Brosmus brosme*), a fish belonging to the Cod family, from the North Atlantic, its southern limit being the Firth of Forth. The length averages from 20 inches to three feet, and there is a single barbule under the chin. An allied species (*B. flavescens*) with two barbules is taken on the American coast.

Tortoises and Turtles constitute the Reptilian order Chelonia, well marked off from all the



GIANT TORTOISE.

other orders by the possession of a dorsal shield, or carapace, and a ventral shield, or plastron, united at the sides, and forming a kind of case, within which the head and neck, limbs (of which there are always two pairs fitted for walking or swimming), and tail can be completely or partially retracted. The carapace is usually covered with hard horny plates called tortoise-shell. The jaws are toothless, and covered with horny sheaths, like the bill of a bird. There are two sub-orders:—1. Athecata, in which the carapace is flexible, with but one living form, the Leathery Turtle (*Sphargis coriacea*), which has a wide range in temperate and tropical seas, and is said to live entirely on marine vegetation. It sometimes attains a length of six feet, and the carapace is marked by seven grooves running backwards from the head. 2. Testudinata, in which the carapace is hard and rigid. These are generally

divided into four families. (1) Cheloniidae, exclusively marine, with the shields of the carapace partially ossified and the feet large and fin-like. They are natives of inter-tropical seas. The two most important forms belong to this family—the Green Turtle (*Chelone viridis*) from the Atlantic, the most highly prized of those used for food, and the Hawk's-bill Turtle (*Caretta imbricata*), from the Indian and Pacific Oceans, from which is obtained the tortoise-shell of commerce. (2) Testudinidae, the land chelonians. One of the best-known forms is the Common Greek Tortoise, often hawked about the streets of London and other large towns. To this family belong the gigantic tortoises of the Galapagos. These attain a length of about three feet. They are rapidly becoming extinct, owing to the facts that their flesh is excellent eating and that a valuable oil is prepared from their fat. (3) Chelydridae, containing forms frequenting marshes and fresh water. To this family belong some European forms and the terrapins of America. (4) Trionychidae, fresh-water turtles, carnivorous in habit, having the carapace covered with soft skin. The webbed digits end in sharp claws. The name "tortoise" appears to have been originally applied to terrestrial, and "turtle" to marine forms; but, though apparently so different, the origin of both words is the same. The meaning is "the animal with twisted feet." The commercial product has always been known as "tortoise-shell," though obtained from a marine chelonian. It is used for combs, jewellery and inlaying, but much less extensively than formerly, perhaps because it is so easily imitated.

Torture. The use of torture as a punishment, or to extort confessions, or to obtain information as to the alleged accomplices in crime was in mediæval days almost universal. But its employment is of a far more ancient date. The Greeks and the Romans, the Persians and the Carthaginians all employed torture. The Greeks made use of both the rack and wheel as a punishment in their Civil as well as Canon Law. For such crimes as treason and sorcery all persons of whatever rank were submitted to torture. Amongst the Romans the *equuleus* or rack, the *angula* or barbed hooks, the *plumbata* or leaden balls, and the *fidicula* or cords tied tightly round the arms, were common methods of torture. The other methods of torture, such as disembowelling, crucifixion, exposure to wild beasts in the arena at the Colosseum, tearing apart by horses, branding and burning alive, and like forms of horrible cruelty were usually inflicted only upon criminals and religious offenders. After the fall of the Roman Empire many of these early tortures continued in use in Europe and became common in England, although the infliction of torture never, as far as is known, was legal in that country. In Scotland, however, torture was legally allowed for extorting information and confessions from those who refused to give evidence in the Courts. But in spite of its not being sanctioned by actual legal enactment, torture in many forms was inflicted in England to extract confessions and evidence from prisoners, as is thoroughly estab-

lished by chroniclers such as Holinshed. In the reign of Henry VIII. a statute dealing with "Pirates and Robbers" states that few offenders guilty of these crimes confess unless under "Torture and Pains." The judges who tried John Felton, the murderer of the Duke of Buckingham, in 1628, when it was suggested that the prisoner should be tortured, unanimously declared that such punishment was against the laws of the land, but Bracton in his *Laws and Customs of England* seems to think that it was legal. In the time of Henry VI. the then Lord Chancellor, Sir John Fortescue, condemned the practice, as also did Sir Thomas Smith, the great statesman and lawyer of Queen Elizabeth's reign. During this latter reign torture is said to have reached its height, "being employed with merciless frequency." Another writer states "that it must be a conviction that until the Commonwealth, torture was constantly used as an instrument of evidence in the investigation of offences whether municipal or political, without scruple and without question of legality." The tortures in use in England and Scotland may be classed as regular and irregular. But both came under judicial authority, and were often ordered by the judges of the Courts. Such instruments as the rack, the "Scavenger's Daughter," the iron gauntlets, the cells, the thumbscrews, the "Scottish Maiden" and the boot were all, except the "Maiden," resorted to for compelling evidence in cases of crime from culprit or suspect, while the "Maiden" was for capital punishment only, and might be called regular. Such tortures as burning at the stake, boiling to death, breaking on the wheel, disembowelling, slaying alive, mutilation and branding, were all more or less irregular methods of inflicting the death penalty with tortures meted out to those who had committed the gravest offences. They were not unworthy of the calculating savagery of the Red Indian. On the Continent the history and modes of torture were much the same as in England, except that perhaps they were even more cruel, as in the case of the German Cells, which were so contrived as to grow daily smaller, until the victim was crushed to death within the walls. The Boot of Spain was made of iron and, after the leg of the victim had been inserted, was placed upon the fire until it became red hot. The worst Continental tortures were those inflicted by the Inquisition; such as the devilishly ingenious device of the Virgin of Nuremberg, an iron figure into which the victim passed, through the whole front opening, when by his weight clockwork was set going which drove round a series of razor-sharp knives, cutting the helpless wretch slowly to pieces. In all the Continental countries except Sweden and Aragon torture was legal. France was the first to abolish it in 1789. Prussia, Saxony and Austria soon followed, and Russia forbade it in 1801, Hanover in 1840, Italy in 1860, while in Germany the Acts permitting it have never been repealed.

Total Reflection. When a ray of light passes from one medium, M , into a denser medium, M' , it is bent in towards the normal to the dividing surface. [REFRACTION.] The ray is naturally

bent away from the normal when it passes from M' to M . The incident ray, IO , will therefore be bent into the position $O R$. As the angle, ION , is increased, OR makes a smaller and smaller angle with the surface, until when the incident ray is in a certain position, $I' O$, the refracted ray is in the surface ($O R'$). Upon inclining $I' O$ still more to the normal we fail to get any refracted ray at all—all the light obeys the laws of reflection—and it is said to be totally reflected. If M be air and μ the index of refraction from air to M' , then $\frac{1}{\mu}$ is the index

of refraction from M' to air. Therefore, $\frac{1}{\mu} = \frac{\sin. ION}{\sin. RON}$ and total reflection begins when RON has become $R'ON'$, i.e., 90° . Hence, $\frac{1}{\mu} = \sin. I'ON$. This

angle is called the critical angle. Hence, the sine of the critical angle is the reciprocal of the index of refraction of the medium, and total reflection occurs when incident rays from the denser medium meet the surface at any angle greater than this critical angle.

Totem, a North American Indian term, with the meaning of "family mark," though some tribes have different words with the same signification. When first used as an English word "totem" seems to have had the meaning of some mythic animal-ancestor, from which a North American family or clan claimed descent. It occurs in this sense in Longfellow's *Song of Hiawatha* (xiv.), where Hiawatha teaches his people the art of picture-writing. He says of the long-dead warriors and hunters—

"Of what kin they are
and kindred,
From what old, ancestral Totem,
Be it Eagle, Bear, or
Beaver,
They descended, this
we know not."



TOTEM—HYDAH CREST POLE
OF NORTH AMERICA.

(By permission of Missionary
Leaves Association.)

And he bade his tribesmen adorn their grave-posts with the inverted totems of the dead who slept

beneath. It is, of course, well known that this poem is founded chiefly on Henry Rowe Schoolcraft's collection of Indian legends. A totem was generally some animal whence the clan was supposed to have descended, and was used as token or emblem by all the members of the clan, its figure being often tattooed on the body. The totem had a religious significance, that is, the totem-animal was in many cases, if not in all, considered as the representative or embodiment of a deity specially favourable to the clan, and a man was prohibited from killing or injuring any animal of the species to which his totem belonged. Thus to the man whose totem was a bear or a beaver, all bears or beavers were in some way sacred; and thus, as Andrew Lang suggests, animal-worship may have arisen. Totemism also had an important bearing on marriage, for no man might marry a woman of the same totem as himself, and so, perhaps, grew up the practice of exogamy or marriage out of the tribe. Besides clan-totems, there are personal totems peculiar to an individual, the subject of special revelation during the ceremonies of initiation at manhood. Totemism is by no means confined to the Indians of North America; it is still found in Australia and Africa, to a less extent in India, and at one time or other has had a wide range over the globe.

Totnes, a town of Devonshire, England, on the right bank of the Dart, 23 miles S.S.W. of Exeter. It is a town of remote antiquity, being traditionally associated with incidents of the British period. Of its old fortifications only the east and north gate and a fragment of the castle keep remain. The principal buildings are St. Mary's Church in the Early Perpendicular, the town hall, grammar school and cottage hospital. It has manufactures of serge and cider, and weaving and fishing are carried on. Pop. (1901), 4,034.

Totonacs, a Mexican people of the Sierra de Huachuclingo, states of Puebla and Vera Cruz, traditionally from the Anahuac tableland, whence they were driven east by the Chichimecs and Aztecs some centuries before the arrival of the Spaniards. They appear to be a branch of the Maya family, closely related to the neighbouring Huastecs of Vera Cruz. The Totonacs were one of the civilised peoples of the New World, and to them are attributed several monuments, such as the two pyramids of Teotihuacan. Zempoala, centre of their power, was reduced by Montezuma a short time before the arrival of the Spaniards. The Totonacs, that is, "Three Hearts," so called from the hearts of three youths, triennially offered to the gods in pagan times, still number about 90,000, nominally Christians.

Toucan, a bird belonging to the Picarian family Rhamphastidae, from tropical America. They live in the depths of the forests, among the branches of trees, and their diet is almost exclusively fruit, though in captivity they are not fastidious. The bill, which is so striking a feature of the bird, is long and wide, is curved above, and is compressed from side to side, and notched at the

edges; the tongue is long and feathered. There are five genera; Rhamphastos, containing the true Toucans, with twelve species, ranging from Mexico to the south of Brazil. The general hue of the plumage is black, with white or scarlet on the neck. The bill is also brightly coloured, and



TOUCAN.

Charles Waterton was probably the first to devise a plan by which this colouring might be preserved after death. The genus *Andigena*, from the South American Andes, contains the Hill Toucans, soberly clad in grey; the species of *Aulacorhamphus*, ranging from Mexico to Peru and Bolivia, have green plumage; and the Toucanets (*Selenidera*), from Veragua to Brazil, east of the Andes, resemble the species of *Pteroglossus*.

Touch. The sense of touch is usually said to include what is known as ordinary tactile sensibility, the sense of pressure, the sense of temperature, and pain. Tactile sensibility is possessed in greater or less degree by all parts of the skin. In some places, *e.g.*, over the heel (where the epidermis is very thick), the tactile sense is dull; while in other parts, such as the tips of the fingers, and particularly the tip of the tongue, it is much more acute. In some instances certain end-organs of nerves appear to be concerned in transmitting tactile sensations. Such special end-organs have been already alluded to under the heading NERVE. In other instances no such special organs can be detected, the nerve-fibres simply breaking up at their terminations into a plexus of fibrillae. In estimating the degree of tactile sensibility of different parts of the body it is customary to ascertain the shortest distance at which the two points of a pair of compasses can be separately distinguished. The distance in the case of the tip of the tongue does not exceed $\frac{1}{4}$ of an inch, while in the middle of the back it is as much as $2\frac{1}{2}$ inches.

Touch-Paper is prepared by soaking paper in a solution of nitre and allowing it to dry. When ignited it does not burst into flame, but smoulders slowly with a small red edge until completely burnt. It is hence largely used as a fuel for the ignition of powder and fireworks, and in blasting, etc., as it

gives the operator sufficient time to retire to a safe distance before the explosion.

Touchstone, a hard black rock employed to determine roughly the composition of gold alloys. Black basalt and dark quartzose rocks may be thus used. The alloy is drawn over the surface and leaves a streak, the colour of which varies with the proportion of gold. It is then to be compared with the streaks made by alloys of known composition.

Toulon, a seaport and first-class fortress in the department of Var, France, 30 miles S.E. of Marseilles. It stands on the north side of a deep bay opening into the Mediterranean, and towards the north and west is sheltered by lofty hills. The whole of the Darse Neuve (or new dock) and one-third of the Darse Vieille (or old dock) are appropriated to the French navy. Adjoining the Darse Neuve are the dockyard, 240 acres in extent, and the magnificent arsenal, which covers nearly 700 acres. On March 12th, 1907, the docks were the scene of a great calamity, when the battleship *Téna* exploded with a loss of more than 100 lives. The principal buildings are the Romanesque church of Sainte Marie Majeure, the hôtel-de-ville, the Musée-Bibliothèque in the Renaissance style, the immense marine hospital and the arsenal. Apart from the arsenal the chief industries are shipbuilding, fishing, lace-making and distilling. The Telo Martius of the Romans, Toulon was repeatedly sacked before and during the Middle Ages. Louis XIV. made it a redoubtable stronghold and in 1707 it resisted the siege of the British fleet. It was during the siege by the forces of the Republic in 1793 (when the inhabitants had delivered the town to the British) that Napoleon Bonaparte first appeared on the stage of history. A monument commemorating the Great Revolution was erected in 1890. Pop. (1901), 101,602.

Toulouse, capital of the department of Haute-Garonne and formerly of the province of Languedoc, France, on the Garonne, 135 miles S.E. of Bordeaux. Three bridges, one of which (the Pont Neuf) is a handsome structure of seven arches dating from the 16th and 17th centuries, afford communication with the suburb of St. Cyprien. On the east and north are the Canal du Midi, connecting the Garonne with the Mediterranean. The greater part of the town consists of narrow, ill-paved streets, but there are some fine mansions of the 16th and 17th centuries. The principal buildings are the cathedral of St. Etienne, the large church of St. Sernin (part of which dates from 1096), Notre Dame de la Dalbade, Notre Dame de la Daurade, the Capitole, or town hall, the Hôtel d'Assézat, the Palais de Justice, the Musée des Beaux Arts, and the Musée St. Raymond, which contains a good collection of antiquities. The university ranks third amongst those in France. The manufactures include guns, powder, agricultural machinery, silk and woollen stuffs, leather, steam-engines, tobacco, paper, carriages, furniture and brandy. Toulouse, the Roman Tolosa, became the capital of the Visigothic kingdom, and was afterwards ruled by Counts, who were practically independent from the 10th to the 13th century,

but on the death of Joan, daughter of Raymond VII., in 1271, the territory was incorporated in the dominions of the French sovereign. Pop. (1901), 149,841.

Touraco, or PLANTAIN-EATER, a bird belonging to the African genus *Turacus*, with sixteen species. They are fruit-eating birds, with short high bill, notched in both mandibles, an erectile crest and green plumage, with some purple on the wings and tail.

Tourcoing, a town of the department of Nord, France, 7 miles N.E. of Lille and forming with Roubaix practically one community. The principal buildings are the hôtel-de-ville, the Musée and several technical institutes. With Roubaix it is the stronghold of woollen manufactures in France, and other industries comprise cottons, linens, silks, carpets, upholstery and sugar-refining. Pop. (1901), 79,243.

Tourgenief. [TURGENIEF.]

Tourmaline, a complex mineral silicate of alumina, with magnesia, boric acid, and smaller proportions of phosphoric acid, iron, manganese, calcium, potassium, sodium, lithium, fluorine and water. Its composition may approximately be represented by the formula $3\text{RO} \cdot \text{SiO}_2 + \text{R}_2\text{O}_3 \cdot \text{SiO}_2$. It crystallises in the Hexagonal system, generally in long three- or six-sided prisms, hemimorphically terminated. It also occurs in needles, sometimes radiating. It has a sub-conchoidal fracture, a hardness of from 6.5 to 7.5, a specific gravity of from 3 to 3.3, and a vitreous lustre. It is very variable in colour, being most commonly black and opaque (schorl); but sometimes transparent and rose-red (rubellite), blue (indicolite), green, yellow, brown, or colourless. Its crystals are sometimes banded or particoloured, the pink-and-green specimens from Paris in the state of Maine being among the most beautiful of American minerals. The transparent varieties when flawless are classed as precious stones, the blue being an excellent substitute for sapphire. Tourmaline is strongly doubly-refractive and pleochroic, the ordinary ray being so completely absorbed that a plate of one of the more translucent varieties, cut parallel with the chief axis of the crystal, acts as a polariser. Two such plates, suitably mounted, form the simple polariscope known as tourmaline tongs. When rubbed tourmaline becomes positively electric; and when heated or cooled the differently terminated ends of its hemimorphic crystals exhibit opposite alternations of electric polarity. Schorl is common in granite, gneiss, schists, and crystalline limestones; with quartz it forms tourmaline rock; and with orthoclase the beautiful black-and-pink luxullianite (named from the village of Luxulian in Cornwall near which it occurs) of which the Duke of Wellington's sarcophagus in St. Paul's is made.

Tournay, or TOURNAI (Flemish, DOORNIK), a town of the province of Hainault, Belgium, 45 miles S.W. of Brussels. Several bridges cross the Scheldt, on both sides of which extend broad quays planted with trees. The newer part of the town has a very neat appearance. Boulevards now occupy the site

of Vauban's fortifications. The fine Romanesque cathedral of Notre Dame has paintings by Flemish masters and amongst other buildings are the church of St. Quentin, the belfry, the old Renaissance Cloth Hall, now lodging a picture gallery and museum, and the town hall. The principal manufactures are Brussels carpets, hosiery, woollens, textiles and faience, besides distilling. Tournay is believed to be Cæsar's *Civitas Nerviorum*. In the 5th century it became the capital of the Franks. In the Grande Place is a statue of the Princess d'Épinoy, who held the town against Alexander of Parma in 1581. Pop. (1900), 36,814.

Tourneur, CYRIL, an English dramatist of whose life very little is known, but who is supposed to have been born about 1575 and who died in Ireland on February 28th, 1626. He seems to have served for a time as a soldier in the Low Countries and Spain. He is remembered by two plays somewhat in the manner of John Webster, *The Revenger's Tragedy* (1607), his greatest work, and *The Atheist's Tragedy* (1611). In 1872 *The Transformed Metamorphosis* (1600), a satire in verse by the same writer, was discovered.

Tourniquet, an appliance used for the purpose of subjecting an artery to pressure, with a view to checking loss of blood in surgical operations, or controlling the flow of blood in the treatment of aneurysm.

Tours, capital of the department of Indre-et-Loire and formerly of the province of Touraine, France, on the left bank of the Loire, 128 miles S.W. of Paris. It is a singularly handsome town, and stands in the midst of a fertile and beautiful district. The fine cathedral of St. Gatien ranges in date from the 12th to the 15th century, with two towers over 200 feet in height, added during the Renaissance period; it contains some magnificent old painted glass. The church of St. Julien and the Archbishop's palace remain, but the greater part of the abbey-church of St. Martin was destroyed during the Revolution. Amongst other buildings are the prefecture, the Musée, school of art and the Collège de St. Louis de Gonzaga, while near the town is a remnant of Plessis-les-Tours, the château-residence of Louis XI. The town has a high reputation for its printing and other industries include iron-founding and engineering and manufactures of chemicals and of confectionery. Tours takes its name from the Turones, of whose country it was the capital. The battle in which Charles Martel defeated the Saracens in 732, though styled the Battle of Tours, was fought between Tours and Poitiers. The town was the birthplace of Honoré de Balzac. Pop. (1901), 64,695.

Tourville, ANNE HILABON DE COFENTIN, COMTE DE, admiral, was born at Tourville, near Coutances, France, on November 24th, 1642. Like Nelson, he was very delicate, but this did not prevent a highly successful naval career. Having served an apprenticeship under Duquesne in the Mediterranean, he became head of the newly-formed French navy in 1690. In the battle of Beachy Head in that year he gained the last

important naval victory of France over Great Britain. Two years later he lost the battle of La Hogue, but in 1693 was made Marshal of France. He was one of the last French admirals to act boldly and promptly on the offensive. He died in Paris on May 28th, 1701.

Toussaint l'Ouverture, FRANÇOIS DOMINIQUE, liberator of Haiti, son of a negro slave, was born at Breda on the island of San Domingo on May 20th, 1743, or 1746. He was a man of considerable natural ability and acquired the nickname of "L'Ouverture" through his bravery in making a breach in the ranks of the enemy. In reward for his services the French Revolutionary Government raised him by gradual steps to the headship of the army in the island. He made use of his position to promote good government, but when Napoleon attempted to re-establish slavery he resisted the effort. The result was that he was betrayed to the French and died in the fortress of Joux, near Besançon, on April 7th, 1803.

Tower of London, a fortress at the eastern extremity of the City, on the northern or left bank of the Thames. The Romans and Saxons both built strongholds on this site, but the Tower as we know it originated with William the Conqueror, at whose instigation the White Tower, or Keep, containing the fine Norman Chapel of St. John, was reared by Gundulf, Bishop of Rochester. A century later William Longchamps enclosed it within walls and a moat, the latter drained in 1843 and laid out as a drill-ground for the garrison. The mass of buildings composing the Tower yields, in historical interest, to no structure in London. In the Wakefield or Record Tower, the reputed scene of the murder of Henry VI., are kept the Regalia or Crown Jewels, some of which Thomas Blood stole in 1671, the "Colonel" making off with the Crown and an accomplice with the Orb. The Banqueting Hall and Council Chamber—the scene of Richard II.'s abdication—have been converted into a magnificent Armoury. The Chapel of St. Peter-in-Vincula, within the precincts, was the burial-place of many of the headsman's victims. Most of these unhappy persons were executed on Tower Hill, to the north-west of the fortress, but a few suffered within the walls at the spot railed off and marked by a stone—amongst them Anne Boleyn (1536), the aged Countess of Salisbury (1541), Catherine Howard (1542), Lady Jane Grey (1554) and Robert Devereux, Earl of Essex (1601). On the water-front is the Traitor's Gate, by which prisoners entered the Tower from the river. Amongst the most illustrious captives were Sir Thomas More, Sir Walter Raleigh and the Seven Bishops. One of the foulest crimes ever perpetrated in the fortress was the murder of the boy Princes Edward V. and his brother the Duke of York, in 1483, at the hands of their wicked uncle, who afterwards mounted the throne as Richard III. In 1674 certain bones, found at the foot of the staircase leading to the White Tower, were conjectured to be those of the hapless lads and reentered in Henry VII.'s Chapel in Westminster Abbey. Lions, leopards, tigers, bears and a few other animals had been kept in the Tower

since the 13th century till 1834, when the menagerie was closed and its inmates were removed to the Zoological Gardens. In this regard it is interesting to note that here young Edwin Landseer made some of his earliest studies of the lion from life. The river-front of the Tower was opened as a promenade at the close of the 19th century. Adjoining the

Townshend, CHARLES, Chancellor of the Exchequer, grandson of the preceding, was born on August 29th, 1725, and educated at Leyden and (possibly) Oxford. He entered the House of Commons in 1747, as M.P. for Great Yarmouth, and soon made for himself a brilliant reputation; but his faults balanced his talents, and his instability



TOWER OF LONDON AND TOWER BRIDGE.

(Photo: York & Son, Notting Hill, W.)

Tower are Trinity House (1793-5), the headquarters of the lighthouse commissioners and the licensers of pilots, the Royal Mint (1811) and the Tower Bridge (1894).

Townshend, CHARLES, 2ND VISCOUNT TOWNSHEND, statesman, was born at Rainham, Norfolk, in 1674 and educated at Eton and King's College, Cambridge. He entered public life as a Tory, but soon became connected with the Whigs. In 1709, when the colleague of Marlborough at The Hague, he disagreed with him on the Barrier Treaty, for which the Tories nevertheless censured him. George I., even before his arrival in England, appointed Townshend his first Prime Minister, but soon dismissed him when he refused to sacrifice British to Hanoverian interests. He was then for a time Lord-Lieutenant of Ireland, but in 1720 rejoined the Ministry. He next became Secretary of State under his brother-in-law, Sir Robert Walpole, and in 1725 concluded the Treaty of Hanover. Of this Walpole disapproved, and the result was the retirement of Townshend from public life, though he did not withdraw until the Treaty of Seville was signed (1729), in which Townshend made several material concessions to Spanish pride and his country's disgust. On his estate at Rainham he introduced the cultivation of the turnip and so was nicknamed "Turnip" Townshend. He died at Rainham on June 21st, 1738.

gained him the name of "the weather-cock." Thus, when in 1761 (now member for Harwich) he became War Secretary he supported Pitt and Bute alternately. He held office in the first Rockingham Administration, but on its break up (1766) became Chancellor of the Exchequer under Pitt (afterwards Earl of Chatham). During the incapacity of the latter he was the leading minister, and did not scruple to use his position to resume the policy of taxing the American Colonies, to which Pitt was opposed. Before he could develop his mischievous views, however, he died suddenly in London on September 4th, 1767. He appears to have been a brilliant orator in an age of great speakers, but unprincipled and lacking in ballast.

Toynbee, ARNOLD, philanthropist, was born in London on August 23rd, 1852. After reading with an army tutor for two years, he gave up the notion of a military career and studied at Pembroke College and finally Balliol College, Oxford. He was much influenced by the social teaching of Ruskin. In 1875 he went to live in Whitechapel and worked amongst the poor there. He was never strong, and the excitement attending the delivery of a public lecture, at which he encountered much interruption, is believed to have hastened his end. He died at Wimbledon on March 9th, 1883. In his memory Toynbee Hall, in Whitechapel, London, was established to carry on his work, the study of political

economy, practical and theoretical, being one of its chief objects, though all forms of literature and art are brought as close to the minds of the people as possible. Toynbee's *Industrial Revolution* (1884) embodies his most important economic lectures.

Trachea, or **WIND-PIPE**. The trachea extends from the lower part of the larynx to about the level of the third dorsal vertebra, where it divides into the two bronchi. The framework of the trachea consists of a series of cartilaginous rings, from 16 to 20 in number, which do not extend completely round the tube, but are deficient behind, where the cartilage is replaced by fibrous tissue. Within the rings is disposed the mucous tissue of the trachea, internal to which is the stratified columnar epithelium, which forms the inner lining of the tube; the most superficial cells, those which abut upon the lumen of the trachea, are ciliated. At the division of the trachea into the two bronchi, the latter are not quite symmetrically disposed with regard to the former, and when a foreign body obtains access to the trachea it is usually found that it penetrates into the right rather than into the left bronchus. The trachea is sometimes affected by inflammation, usually as the result of the extension of mischief from the larynx.

Tracheæ, a term applied strictly in vegetable histology to true vessels or cell-fusions in which the transverse walls have been absorbed. They occur in the wood of many spermatophytes. Elongated cells with lignified walls, losing their cell-contents (cytoplasm) at an early stage, and otherwise resembling tracheæ, are termed tracheids, the two being classed together as tracheal tissue. Tracheids are especially characteristic of the wood of Pteridophytes and Conifers. Tracheal tissue serves chiefly for the conduction of water.

Tracheal Gills are the structures found in many aquatic insects by which respiration is effected. They resemble and act as gills, though morphologically they are tracheæ. These are minute tubes usually ramifying throughout the whole body of the insect. In the aquatic forms these extend out from the body as plates or tufts, which come in contact with the air dissolved in the water.

Tracheata, a term used as the name of a group of animals, including all those which breathe by means of tracheæ—namely, minute tubes ramifying through the body and opening to the exterior. The group would include the Protracheata—i.e., Peripatus—the Myriapods (Centipedes and Millipedes), the Insects, and Arachnida. It is doubtful, however, whether the tracheæ in these four classes are developed in the same way, while many of the Arachnida, such as *Limulus* (the King Crab), breathe by gills and not by tracheæ. The name has not, therefore, been generally adopted.

Tracheotomy, the operation of opening the trachea (with a view to the insertion of a tube through which the patient can breathe) in cases of obstruction to respiration through the natural passages. It is sometimes performed in diphtheria and other forms of disease affecting the larynx, and

in instances where pressure is exerted upon the upper air-passages by tumours and the like.

Trachymedusæ, an order of Hydrozoa belonging to the class Craspedota, including those jelly-fish in which the tentacles are solid, except sometimes in the adult. The adult is produced by a series of metamorphoses from a free larva, in the form of a small Hydra-like animal. The order includes two sub-orders, the Narcomedusæ and Trachomedusæ.

Trachynemites, one of the few known fossil jelly-fish. It belongs to the order Trachymedusæ, the members of which have absolutely no hard parts in their bodies; they cannot, therefore, in ordinary circumstances, be preserved as fossils. Impressions of the body have, however, been left in the fine mud which has consolidated into the Solnhofen slate of Bavaria.

Trachyte, a volcanic rock or lava, named from the rough surface with which it breaks (Greek *trachus* = "rough"). It belongs in composition to the intermediate class, consisting essentially of sanidine felspar, and containing from 60 to 64 per cent. of silica. Its other chemical constituents are: alumina 17 per cent., iron oxide 6 to 8 per cent., soda 4 per cent., lime 3 to 5, potash 2 to 2.5, magnesia 1. In addition to sanidine it contains some triclinic felspar, and usually hornblende, biotite mica and magnetite, with occasionally augite, apatite and tridymite. Its average specific gravity is 2.65. It varies in texture, but is largely glassy with felspar microliths and hornblende needles. It belongs mostly to Tertiary volcanic outpourings, being one of the commonest of modern lavas.

Tractarians, the name given to a small band of men who started what was known as the "Oxford Movement" in 1833-41. They published a series of papers entitled *Tracts for the Times*, amongst the writers being John Henry Newman, John Keble, Edward Bouverie Pusey, Isaac Williams and Richard Hurrell Froude. But their campaign did as much probably for the Catholic as for the English Church.

Traction Engine is a steam locomotive specially designed for drawing heavy loads over ordinary roads. The boiler is usually of the locomotive type, and a simple or compound engine is secured to the upper part of the shell. The crank-shaft (usually at the fire-box end) is connected by spur gear with a pair of large driving-wheels; the front wheels are capable of being turned for steering. To obtain sufficient grip on the road, and at the same time not to damage it, the driving wheels are made with wide rims, to which diagonal blocks are riveted. Light traction engines are often used for agricultural purposes, in which case the gearing is made so that it can be detached from the wheels, in order that the engine may be used for driving threshing and other machines.

Trade, **BOARD OF**, is technically a Committee of the Privy Council of the United Kingdom appointed for certain purposes. Practically it is

that department of the Government which deals with almost any point concerning national commerce. Originated by Oliver Cromwell, the institution had a chequered and spasmodic existence until 1786, when an Order in Council established it in much its present form. Since 1864 its President has been a Cabinet Minister, and its principal officers are the secretaries and the chief of the Statistical Department. At different times the departments have been modified, and as new exigencies arise fresh modifications are made. Besides the original department of Statistics and Commerce, it has a Railway Department (1840), which examines plans for new railways, inspects railways before they can be opened, inquires into the causes of accidents, and controls also tramways, gas, water, and electric-lighting companies; a Marine Department (1850), which surveys channels, etc., provides for examination of officers for Mercantile Marine, regulates shipping offices, pilotage, wage-disputes, etc.; a Harbour Department (1866), which deals with harbours, foreshores, lighthouses, navigable channels, etc., oyster- and mussel-fishing, piers, wrecks, quarantine, weights and measures; a Finance Department (1866); and the Fisheries Department. The Statistical Department issues monthly the *Board of Trade Journal*, which gives much valuable information as to consuls' reports, tariffs, markets, etc. The Labour Department, which has to collect information on such matters as the condition of employment, the details of labour disputes, etc., is the most recent addition. The Patent Office and the Bankruptcy Department are also under the Board.

Trade Marks. As early as the reign of Queen Elizabeth we have evidence of the existence of trade marks, and in 1783 Lord Mansfield decided a case concerning them. In 1875 an Act laid down a regulation as to what constitutes a trade mark, and provided for their registration, an Act of 1862 having already made it a misdemeanour to counterfeit or forge a trade mark. An international convention was held upon the subject in 1883. The Act of 1887 consolidated the regulations and defines offences. The Trade Marks Act 1905 (which consolidated and amended previous Acts) regulates the law of such marks, and under this Act registration gives exclusive right to the use of the mark after the lapse of five years, and this registration protects such use for fourteen years. Should the Comptroller of Patents refuse to register, there is an appeal to the Board of Trade, and so on to the House of Lords. There are five provisions as to what constitutes a trade mark; it may be (1) the name of a person or firm printed, impressed, or woven in a particular manner; (2) a written signature, or copy thereof; (3) a brand, device, heading, label, mark, or ticket; (4) an invented word or words; (5) any word or words not bearing any geographical import. An important enactment on this question enforces the marking of the country of origin upon all foreign manufactured goods which are imported into the United Kingdom.

Trade Unions may be described as the association of workmen in particular branches of trade

for joint action in certain directions, namely, the regulation of wages, hours, and other conditions of labour, and for mutual relief. Trade unions (which have not yet been connected historically with the mediæval guilds which they resemble in some respects) arose in various trades in England during the 18th century, as the mediæval regulation of trade broke up and the distinction of master and workman became sharper. In 1799 all combination among workmen was prohibited by law; in 1824 the law was repealed, and a period followed of marked activity, which excited much hostility among the middle classes, evinced, e.g., in the sentence of seven years' transportation on six Dorchester labourers in 1834 for conspiracy (in administering a trade-union oath). This activity declined with the decay of the propagandism initiated by Robert Owen and of the Chartist agitation, but the great strike of engineers in 1852 and builders in 1859 gave the movement a fresh impulse. The Royal Commission of 1867-9 was appointed in consequence of the outrages which were committed under the auspices of certain unions in Sheffield and Manchester, "rattening" being one of the most innocent of the malpractices. These outrages have been graphically, and apparently not unfairly, described by Charles Reade in *Put Yourself in his Place*. The outcome of the Commission was the passing of the Trades Union Act of 1871 and 1876, which together recognised trade unions, secured protection to their funds, and legalised "picketing" unaccompanied by violence. Since that time the principle of trade unionism has steadily advanced, and some of the developments give much food for reflection. The main objects of the majority of trade unions may be put down under some or all of the following heads: (1) The publishing of statistics as to the condition of trade; (2) the registration of men and masters in search of and prepared to give work respectively; (3) the aid of members of the association who are in search of work; (4) the regulation of the number of apprentices to be employed; (5) the aid of members of other trades who may be on strike; (6) the regulation of conditions of work; (7) the organisation of strikes in the event of the failure of more pacific methods of attaining their ends. Almost invariably trade unionists refuse to work with those who are not members of the union, a practice which seems inconsistent with that freedom of action in disposing of his labour which is thought to be every freeman's right. On the other hand, it should be pointed out that most unions insist upon their members doing their work in a proper manner, the result of complaints in this direction being reprimand, and, if necessary, expulsion from the union. Strikes, as Alfred Marshall, Professor of Political Economy in Cambridge University, has pointed out, are, like warfare, an admission that peaceful means have proved inadequate; and in spite of the combative attitude of the "New Unionism," many authorities prophesy that labour warfare will in time lead to industrial peace through Boards of Conciliation. The general working of a union may be judged from some details concerning one of the most widespread and most important of these

societies—that of the Amalgamated Engineers. This contains more than 400 branches. The central authority is vested in a General Council, whose permanent officer is the General Secretary, who receives a good salary, has large powers, and has among other duties that of issuing weekly, monthly, and yearly reports. Next come local district committees; and each branch manages its affairs through a secretary and a referee, elected annually, and a president, vice-president, and assistant-secretary, elected quarterly, assisted by a committee and various subordinate officers. Attention to duties is secured by a system of fines upon those who are negligent. The Society of Compositors has a peculiar feature in the existence of the "Father of the Chapel," whose duties are to see that Society regulations are carried out in the places where they are in vogue. This may be a relic of the old printing guilds.

Trade Winds. [WIND.]

Traditor, among the Early Christians, one who in time of persecution gave up the Scriptures, or the names of his brethren, or any of the holy vessels, to the officers of the law. It is the Latin form of the word "traitor."

Trafalgar, CAPE, a promontory near the southern extremity of the Spanish peninsula, about midway between Cadiz and Tarifa. It is famous as the scene of Nelson's last battle (October 21st, 1805), in which a brilliant victory was gained over the French and Spanish fleets. The common English pronunciation is erroneous, the accent correctly falling on the last syllable.

Tragedy. [DRAMA; THEATRE.]

Tragopan, a bird belonging to the genus *Cerionix*, of the Pheasant family, with five species from the Oriental region. The plumage is brilliant; there is a wattle, inflatable at will, on the throat, and from the erectile horns these birds are sometimes called Horned Pheasants.

Trajan (MARCUS ULPIS TRAJANUS), fourteenth Emperor of Rome, was born at Italica ("Old Seville") in Spain probably about A.D. 53. Having served with distinction in the Roman armies, he was in 97 adopted by Nerva as his successor. Next year he succeeded to the purple. After several campaigns (101 to 106) he brought the Dacians under the rule of the Empire. In 113 he set out on an expedition to the East, and soon reduced Armenia and Mesopotamia; but in 117 died at Selinus (modern, Selenti) in Cilicia, when on his way back to Italy. As memorials of his greatness he left the Forum Trajani and Trajan's Column at Rome (commemorating his Dacian triumphs), the harbour of Civita Vecchia, and Trajan's Wall, running from the Danube to the Black Sea.

Tralee, the county town of Kerry, Ireland, on the Lee, about a mile from its discharge into Tralee Bay, 21 miles N.W. of Killarney. The chief buildings are the town hall, court-house, corn exchange, and hospital. A ship canal admits vessels of 200 tons' burden from Tralee Bay. There is a very considerable export trade of agricultural and dairy produce. Pop. (1901), 9,660.

Tramway (Swedish, *tramm*, "log") is generally used to signify a street railway, along which cars are smoothly propelled by horses, steam, electricity, or other motive power. Such roads were early employed in mining districts for the purpose of hauling coal and other minerals more easily. Benjamin Outram (1764-1805) in 1800 tried to develop the system, and some have looked to his name for the etymology of the word. A tramway was constructed in 1801 between Croydon and Wandsworth; but George Francis Train started the first street tramway at Birkenhead in 1860, and in 1861 he was allowed to give the experiment a trial in Park Lane, London. The idea, in spite of discouragement, caught on, and in 1870 such progress had been made that the Tramway Act was passed, having for its object to provide for questions of right of passage, gauge, width, repairs, powers of purchase, etc., and tramways are now, like railways, subject to Board of Trade inspection. The earlier tramways sometimes had rails above the level of the roadway, but this system entailed such difficulty and danger to ordinary traffic that it was generally abandoned, and the system, now generally in use, was adopted in which the rail has a groove, into which a flange upon the wheel fits. The advantage of this is that derailment is almost obviated, but it has the disadvantage of increasing friction, owing to the choking up of the groove. Many years ago the omnibuses plying in the suburbs of Manchester passed through Salford upon plain rails, flush with the street, the vehicle being kept on the line by means of a wheel, which could be let down, and which fitted into a groove running parallel to and midway between the rails. The system of flat rails prevails in some Continental towns. The friction is less, especially upon curves, but derailment is frequent. The tramway companies are, for obvious reasons, compelled to keep their ways in repair, as well as the roadway to a certain distance on either side of the line, since the constant drawing on and off the line of ordinary vehicles greatly tries the outer edge of the rail and the roadway adjoining it. Horse-power was at first the general mode of draught, but the constant straining upon starting told heavily upon the animals, and other and more economical methods have been adopted. Of these steam is the most objectionable and has been little used. Compressed air has been tried, with moderate success. Upon steep gradients an endless travelling cable worked by a fixed engine has been found efficacious. In this system the passenger car is preceded by a dummy car, which has an ingenious arrangement for gripping and letting go of the rope. Of recent years great developments in the way of motive-power for trams have taken place. Electricity is now extensively employed, both with the overhead wire and the underground wire systems, and this method of traction is almost always adopted by municipalities owning the tramways. Lines have been laid down in populous country districts, outside of urban areas, and the extension of electric trams on a large scale seems to be probable in the near future. In the chief Continental cities electric tramways are almost exclusively employed.

Transcendentalism represents the doctrine of some of the Schoolmen that there are ideas which rise entirely above (transcend) experience, and cannot be brought under any of the Ten Categories. Such an idea is that of *Ens* (ὄν), pure being, which embraces the One, the Pure, the Good. Kant draws a distinction between Transcendent and Transcendental. By Transcendental he understands such *a priori* ideas as are manifested only in experience, *e.g.*, Time, Cause, Space, etc. (*i.e.*, what has relation to the permanent mental conditions of experience); while by Transcendent he understands "such ideas as are above experience, *e.g.*, God, Soul, etc." The term Transcendentalism has now come to be synonymous with high-flown, fanciful, impracticable ideas, which refuse to be controlled by experience. It has also been applied to the idealism of Emerson.

Transept, one of the two subdivisions of the transverse arm of a cruciform church. In a structure on that plan the leading parts converge upon what may for convenience sake be called the centre (beneath the spire or tower in churches possessing that feature)—the choir on the east, the nave on the west, one transept on the north and another transept on the south. Thus the north and south transepts might be described as the short arms of the cross.

Transformer, in electricity, is a device by means of which the pressure of an alternating current may be increased or reduced, the current strength being correspondingly reduced or increased. It essentially consists of two coils of insulated wire, wound on an iron core, usually so arranged that the magnetic circuit is closed. Numerous inventors have designed many different patterns, which, however, principally differ in appearance and in the ease with which they may be constructed. The iron core must be carefully laminated to avoid loss by eddy currents, and as transformers are usually used to reduce a current at 2,000 volts in the mains to a current at 100 volts suitable for use in houses, great care must be expended upon the insulation of one coil from the other. If a current at 2,000 volts is to be converted to one at 100, the primary winding must have twenty times as many convolutions as the secondary, and as the secondary current will be twenty times stronger than the primary, the former main must be of twenty times the section of the latter. A current at 2,000 volts can of course be distributed by a much smaller main conductor than one at 100 volts, and thus a saving both of capital and expenditure by loss in mains may be effected, more especially in supplying a scattered district; but against this must be set the cost of transformers and loss by reason of their want of perfect efficiency.

Transfusion. The operation of transfusing either the blood of a healthy person or some form of saline infusion into the veins of another person is in rare instances performed. It is of value in cases where the patient operated upon has been the subject of great loss of blood, or where the blood, though normal in quantity, is poisoned by carbonic oxide or by certain disease products.

Transit Circle, or **MERIDIAN CIRCLE**, is an improved form of transit instrument. The latter was invented by Olaus Römer (1644-1710), the Danish astronomer, at the end of the 17th century for noting the time of a star's passage over the meridian. The time noted on a sidereal clock, and converted into degrees at the rate of 15° per hour, gives the right ascension of the star. A meridian quadrant had been used by Tycho Brahe, but neglected until Römer revived the idea that a fixed meridian instrument would enable observations to be made with far greater convenience than the method generally employed. It consists of a horizontal axis, with a telescope fixed at right angles to it, the whole being adjusted so that the telescope shall revolve in the plane of the meridian. The axis of the instrument consists of a cube of metal, at opposite sides of which are two cones ending in cylindrical pivots, resting in V-shaped bearings. The telescope is fixed in a hole through the centre of the cube, and a certain arrangement of levers and friction wheels is adjusted to relieve the pivots of most of the weight of the instrument. So far this is a transit instrument, and the transit circle differs from it in possessing two large circles—a yard or more in diameter—fixed on the axis at each side of the telescope, the circumference of each being graduated to 5' or less. The readings are made by four or more microscopes (which thus correct each other), often fixed to the stone piers which support the whole. The instrument is adjusted so that its axis is horizontal and points due east and west, while the axis of the telescope is at right angles to it. Although workmanship of the very highest order is expended, absolute accuracy in these adjustments is never obtained, but the errors due to the different deviations can be separately estimated, and the observed result can be corrected for them. It is essential that the telescope shall be quite rigid, for any bending will give rise to errors in the calculated declination of the observed star. The telescope is provided with several vertical and one or two horizontal spider-lines, and the time of passing each vertical line is noted by a clock. This is usually provided with a seconds pendulum which, by passing through a globule of mercury, completes an electric circuit once every swing. A time-recorder or similar contrivance is then brought into play, and a dot is marked on a moving slip of paper every second; but the observer, as he sees the star cross a certain line, can, by pressing a knob, also cause a dot to be made on the slip of paper. The distance of this dot from the previous second's dot enables him to tell to less than one-fifth of a second the exact time or passage of the star. By means of the transit circle not only is the time of transit of a star measured but also its declination—a feat impossible with the older transit instrument. The first transit circle used in Great Britain was set up at Greenwich in 1850, the transit instrument and mural circle having been used till then, although long superseded at Göttingen and Königsberg by the circle.

Transit of a Star occurs when the star just crosses the meridian, and is the phenomenon

observed for determining the right ascension of the star. The absolute right ascension of a star is obtained by noting the time which elapses between its transit and that of the sun, the declination of the latter being observed at the same time. Transit is also the name given to the passage of one celestial body across another. Thus Jupiter's satellites exhibit transits across his disc in front as well as suffer eclipses behind him. The more important transits, however, are those of the inferior planets Venus and Mercury across the sun's disc. The transit of Venus especially has caused more excitement than any other astronomical phenomenon, and more pains have been taken by astronomers of different countries acting in unison to observe it accurately. Correct observations on this motion owe their importance to the fact that they have been used as the chief factors in the determination of the sun's distance from us, and therefore in the estimation of all astronomical measurements.

Transmigration, or METEMPSYCHOSIS, the doctrine of the re-birth of the human soul in another human body, or in that of one of the lower animals. In a very primitive form the belief in transmigration exists among many of the lower races at the present day; but it was in the East that the doctrine first appeared as having a bearing on man's conduct, the good rising higher and the bad falling lower at each re-birth. From India it passed to Egypt, whence the Greeks borrowed it and brought it to Europe, the Romans receiving it from the Greeks. Whence the Jews learnt it is uncertain, but traces of it may perhaps be detected in The Wisdom of Solomon viii. 20 (Apocrypha) and John ix. 2. The question in the last-cited passage may be an echo of the Hindu teaching that the wicked shall be born again blind or deformed. In the present day the theory has attractions for many, since it seems to be the complement of, or, more properly, implicitly contained in, the theory of evolution. This notion is found in Charles Kingsley's *Water Babies* (ch. ii.) as a kind of gloss on "It doth not yet appear what we shall be" (1 John iii. 2). Professor E. B. Tylor (*Primitive Culture* ii. 2) puts the case strongly: "One of the most notable points about the theory of transmigration is its close bearing upon a thought which lies very deep in the history of philosophy—the development theory of organic life in successive stages. An elevation from the vegetable to the lower animal life, and thence onward through the higher animals to man, to say nothing of superhuman beings, does not here require even a succession of individuals, but is brought by the theory of metempsychosis within the compass of the successive vegetable and animal lives of a single being."

Transmission of Power. It is generally necessary to convey the power developed by a steam-engine or other prime mover to a greater or less distance before it can be made available. Thus in factories rotating shafts and belt- or rope-gearing are employed to distribute to various machines the power of a main engine. In many cases power can be cheaply generated at some place where it is not wanted; and it is, therefore, of great

importance to have some efficient method of transmitting it to places, possibly at a considerable distance, where it can be made use of. Rope-gearing, on an extended scale, may be used, but a long length of wire rope must be supported at frequent intervals upon pulleys, and the consequent friction produces a serious loss. The system is, however, rather extensively used for the propulsion of tramcars, as the excess of the cost of power produced by horses over that of a steam-engine is sufficient to allow of a large loss in transmission. A continuous loop of steel wire cable travels in a slotted tube, buried in the roadway, being, of course, supported on suitable pulleys, and is kept in motion by passing round a drum in the engine-house, this drum being turned by an engine. A clutch on each car projects into the tube, and can be caused to grip the moving cable as required. Fluid pressure—of steam, air, or water—is used for power transmission in various ways. Steam from a boiler may be conveyed for a limited distance in pipes if precautions are taken to avoid loss of heat by radiation, and may, of course, supply an engine of any kind, but the loss due to condensation is so serious that the distance can only be comparatively small. Compressed air is frequently used to supply power at the bottoms of mines, an engine on the surface pumping the air into a pipe leading to an air-engine below. The heat produced during the compression of the air [THERMODYNAMICS] is, however, a source of loss. Hydraulic power is of much more general application, for water at a pressure of 700 or more pounds per square inch may be conveyed for long distances in pipes with but little loss by friction, and can be conveniently applied to the operation of lifts, cranes, riveting and other machines. Power is in this way distributed over a considerable portion of London and other large towns, as well as in docks, on board ships, etc. For most purposes electricity seems the most efficient agent for the transmission of power. [DYNAMO-ELECTRIC MACHINERY.] The substitution of small electric motors for the shafting and belts in many factories would result in an economy, and it is proved by experience in the United States and other countries that, when the conditions are suitable, power can be supplied to tramcars by electricity more efficiently than by any other means. The fact that a high-tension current can traverse a long wire with a trifling loss has already rendered it possible to transmit power efficiently to a distance of more than 100 miles, and the power of Niagara Falls has been utilised.

Transom, in architecture, the crossbar separating a door from the faulight above; also a bar of timber or stone across a window.

Transpiration, the loss of water in the form of vapour from the general surface of a plant, especially through the stomata. Stephen Hales determined that a sunflower with 5,616 square inches of leaf-surface loses 30 fluid ounces in 12 hours' daylight. Transpiration is most active in dry, warm air, and in the light, as then the actively-assimilating guard-cells of the stomata become most turgid and curved. Transpiration sets up a

current from the roots, which has been measured, by adding a solution of lithium-citrate and then using the spectroscope, as 118 centimetres an hour in the tobacco-plant. This current travels by way of the xylem of the albuminum, the tracheal system of which contains broken columns ("*chapelets de Jamin*") of air and water. The air is rarefied by the removal of its oxygen, becoming, in the tops of trees, almost pure nitrogen; and the active protoplasmic cells of the medullary rays, in their rapidly-alternating catabolic and anabolic processes liberating and absorbing water, act on the tracheal elements alternately as force-pumps and suction-pumps. As these tracheal elements have their transverse septa at one level in each radial series, but not at the same level in the contiguous series, the water travels upwards round the stem, step by step, the pits in the radial walls of the vessels being its chief channel. This complex process has been successfully investigated by Sachs, Elfving, Robert Hartig, and, above all, Emil Godlewski.

Transportation, the removal of a criminal into another country. This punishment was introduced in the reign of Queen Elizabeth, and is now chiefly regulated by the Statute 5 Geo. IV., c. 84. Practically, however, it is obsolete in the British Empire. The Cape of Good Hope refused to receive convicts as far back as 1849. New South Wales declined to be the dumping-ground for British felons after 1853, and since 1867 no convicts have been sent to Australia. The practice is still observed on a large scale by Russia and, to a trifling extent, by France. [PRISONS.]

Transubstantiation is a doctrine of the Greek and Roman Churches, which teaches that in the Eucharist the substance of the bread and wine is changed into the body and the blood of Christ, although the accidents of the bread and wine remain. The belief is to be found as early as the 9th century, though the term was not formally approved till the Fourth Lateran Council, in 1215. The Council of Trent stated the doctrine explicitly as against those who held the doctrines of impanation and consubstantiation. The Catholic Church holds that the Greek and Latin Fathers imply the doctrine, though they may not explicitly declare it. The truth of the doctrine is utterly beyond proof upon physical principles, especially with those who, rejecting the old scholastic theory of substance and accidents, look for nothing beyond phenomena.

Transvaal, THE, a British Colony of South Africa, bounded on the N. by Southern Rhodesia, on the E. by Portuguese East Africa and Swaziland, on the S. by Natal and the Orange River Colony and on the W. by the Bechuanaland Protectorate. It covers an area of 111,196 square miles. It occupies an elevated plateau, with an average altitude of 3,000 feet, the configuration of which has been compared to a saucer. It is drained by two great rivers—the Vaal, which skirts it on the south, and the Limpopo, or Crocodile, which, flowing north-westwards from Pretoria, sweeps round

so as to form the boundary on the north-west and north, after which it trends away in a south-easterly direction to the Indian Ocean. Owing to its elevated position the climate is, on the whole, healthier and more bracing than is usually the case in the neighbourhood of the tropics. The Transvaal was once a famous hunting-ground, but the big game, including the leopard, lion, buffalo, elephant and giraffe, which attracted the earliest European visitors, have almost entirely retreated. The mineral wealth of the country includes gold, in which it is extremely rich (between 1884 and 1905 the production amounted to £145,000,000), diamonds, tin, copper and coal. Sheep, cattle, pigs and horses are raised on an extensive scale. The industries comprise, besides mining and stock-rearing, iron- and brass-founding, engineering, milling, brewing, the making of bricks and tiles, tobacco-manufacture and the building of carriages and waggons. The original founders of the state were Boers, who migrated from Cape Colony between 1833 and 1837 to avoid annexation by the British Government. The independence of the new settlement was practically acknowledged by the British authorities in 1852. Owing to the financial embarrassment and general disorder, produced mainly by constant wars with the natives, the country was annexed by the British in 1877. The Boers, however, were dissatisfied with British rule, and in 1880 a revolt broke out, which was terminated in the following year by a treaty restoring self-government in internal affairs, but leaving the control of foreign relations to the British Crown. Further concessions were made in 1884, when the British Resident was replaced by a Diplomatic Agent and the country became known as the South African Republic. Numbers of foreigners (or *Uitlanders*) settled in Johannesburg in connection with the gold-mining, and in 1895 great discontent was manifested among them owing to their being debarred from the franchise. This finally resulted in the Jameson raid (1896). Matters then grew more strained between the Transvaal and the British Government, and in 1899 war broke out, the Orange Free State making common cause with their Dutch brethren. Next year both states were occupied by the military and on May 24th, 1900, the Orange River Colony (as it was then and henceforth called) was annexed to the British Crown, the Transvaal being annexed on the 1st of September. Hostilities, however, dragged on until May 31st, 1902, when peace was agreed to. On December 6th, 1906, letters patent were issued providing for responsible government by a Legislature of two chambers. The Legislative Council consists of 15 members, ultimately elective, but for the first Parliament nominated by the Governor. The Legislative Assembly comprises 69 members, distributed thus—34 seats to the Rand, 6 to Pretoria and 29 to the rest of the Transvaal. If not previously dissolved by the Governor, the Legislature automatically dissolves at the end of every five years. Manhood suffrage prevails and the members are paid. Pretoria (21,161) is the capital, but Johannesburg (158,580) the largest town. Pop. (1904), 1,270,023, of whom 297,277

were whites, 937,127 natives, 12,318 Asiatics and the remainder other coloured races. Chinese labourers (not taken into account in the foregoing figures) introduced for the mines in 1904 amounted to 53,000 in February, 1907, but further importations had already been prohibited and arrangements made for their repatriation.

Transylvania, a portion of the kingdom of Hungary, bounded by Hungary on the N. and W., Moldavia on the E. and Wallachia on the S. (the two latter principalities forming Roumania). It has an area of 21,512 square miles. It consists of a tableland, enclosed on the north, east and south by the Carpathians, and crossed by spurs of the same mountains. It is watered by the Szamos, Maros, Körös and Aluta. The Latin name, which has been in use since the 12th or 13th century, refers to its position "beyond the woods" of Hungary. Although wide tracts are still covered with the forests, from which its Magyar and Roumanian names (Erdély and Ardealn) are derived, nearly one-half of the surface is either tilled or pasture land. The soil is fertile, yielding abundant crops of maize, wheat, rye, oats, potatoes, flax, hemp and tobacco; the vintage is also plentiful, and various fruits, such as the apple, peach, plum and almond, are extensively cultivated. Horse-breeding is an important industry. The forests maintain large herds of swine, and much care is devoted to the rearing of cattle and sheep. Transylvania is rich in gold and silver; copper, quicksilver, iron, lead and salt are also worked. The manufactures and commerce are inconsiderable. More than half the population is composed of Roumanians or Wallachians, who prior to 1848 had no share in the political privileges enjoyed by the Hungarians, the Szeklers, and the Saxons (Germans who colonised the country in the 12th century); there are also large numbers of gypsies, Jews, Greeks, Armenians, and Slavs. After the struggle in 1848 between the Roumanians on the one hand and the "privileged nations" on the other, Transylvania was made an Austrian Crownland; but in 1860 a return was made to the older arrangement, and in 1868 it was finally incorporated in Hungary. The chief towns are Klausenburg or Kolozsvár (49,295), Kronstadt or Brasso (31,689), Hermannstadt or Nagy-Szeben (29,577), and Maros-Vasarhely (19,091). Pop. (1900), 2,456,838.

Trappists, THE, an order of Cistercian monks, originally founded in 1140 at La Trappe in the French department of Orne. The rules were very rigid; but, as with other orders, they were neglected and reform was badly needed at the time of its introduction by Abbot de Rancé, in the middle of the 17th century. The time of the monks is divided between work, meditation and prayer. They rise to the first service at 2 a.m., and go to bed at 8 p.m., and pass twelve hours out of the twenty-four in prayer. They are vegetarians, but are allowed milk and cheese, except on fast-days. Some houses permit beer, cider, or wine as a drink. Perpetual silence is the rule, except on specified occasions, the Abbot and the Guest-Master only being allowed to speak.

The order is to be found in England, Ireland, France, America and Belgium.

Travancore, a native state of Madras, India, occupying the south-western half of the extremity of the peninsula, comprising the coastland from Cape Comorin to 10° N. It covers an area of 6,730 square miles. The state is traversed by spurs of the Western Ghats, beyond which a plain, 10 miles in width, densely covered with areca palms and cocoa-nuts, stretches along the coast. In the valleys are many lagoons, formed from the overflow of the rivers. The products include rice, pepper, cocoa-nut, areca-nut, copra and tobacco. Trivandrum (57,882) is the capital. Pop. (1901), 2,951,038.

Travertine, a freshwater limestone, deposited by springs, is said to take its name from Tivoli (the ancient Tibur), where it accumulates very rapidly. At San Filippo, in Tuscany, it forms a foot thick in four months, a hill $1\frac{1}{2}$ mile long, $\frac{1}{2}$ mile broad, and over 250 feet high, being made up of it. It varies in texture, but is generally rather porous, and white or light-coloured. It has been largely used as a building material in the Colosseum and elsewhere in Rome, in the Roman Pharos in Dover Castle, and in many Kentish churches. Its formation is probably initiated by the action of living green mosses, hypnum, etc., removing carbon dioxide from the water, and thus bringing about the precipitation of calcium carbonate. The springs are, therefore, termed "petrifying" ones. The rock is also known as calcareous tufa or sinter.

Treadmill, as an instrument of punishment in use in prisons, was introduced into England by Sir William Cubitt (1785-1861), the civil engineer, in 1818. It consists of a wooden cylinder, fixed upon an iron framework, from 20 to 25 feet wide, and 5 to 6 feet in diameter, and is fitted with steps $7\frac{1}{2}$ inches apart. Its speed is regulated by a brake, and the circumference generally passes over a distance of 32 feet per minute. The time spent on it is generally 6 hours per day, divided into two spells of 3 hours each, the alternation of work and rest during this time being 15 minutes of the former and 5 minutes of the latter. A man thus climbs more than $1\frac{1}{2}$ miles per day. The men upon it are in separate compartments, and have a hand-rail to hold on by. The wheel is generally made to do some useful work, such as grinding corn or pumping water. No prisoner, however, is subjected to the treadmill who is not physically strong enough to endure the punishment.

Treason is the highest crime known to the law and it consists in—(1) Compassing the death of the Sovereign, or his or her Consort, or of the Prince of Wales; (2) Violating the Consort of the King, or his eldest daughter unmarried, or the Princess of Wales; (3) Levying war against the Sovereign within the realm, or being adherent to such, or relieving same; (4) Killing the Lord Chancellor or the Lord Treasurer, or any judge while on the Bench, and generally (5) Committing such other offence or offences as should by any Act of Parliament be declared treason. A person

accused of treason must be prosecuted within 3 years of its commission, if the offence be committed within the realm, except in case of a designed assassination of the Sovereign. When the treason consists of an attempt to assassinate the Sovereign the offence is triable as murder, but continues punishable as treason. Under the Statute 11 and 12 Vict., c. 12, it is made felony to intend to depose the Sovereign, or to place duress upon him in order to compel him to change his counsels, or to intimidate either House of Parliament, or to incite any foreigner to invade the Kingdom. Lastly, under the Statute 5 and 6 Vict., c. 51, it is made a high misdemeanour to strike at the Sovereign, or to discharge firearms near his person with intent to alarm, and it is immaterial whether the pistol or gun be loaded with ball or not.

Treasure Trove. In English law any money, coin, gold, silver, plate, or bullion found (*trouvée*) hidden in the earth, the owner thereof being unknown, in general belongs to the Crown, and forms one of the precarious sources of its revenue. When, however, it is found in the sea, or upon the earth, it does not belong to the Crown, but to the finder, in case no one appears to claim it. In many cases treasure trove belongs by special grant or prescription to the lord of the manor within whose limits it is found.

Treasury, THE, a Governmental department of the United Kingdom which has charge of the Civil List and the receipts and expenditure of the revenues generally. It was originally presided over by the Lord High Treasurer, but this office has been continuously, from the reign of Queen Anne, put in commission. The Commission consists of the First Lord of the Treasury, who is generally Prime Minister, the Chancellor of the Exchequer, who is head of his own department, and a few junior Lords. There are also two secretaries—the Patronage Secretary, better known as the Government Whip, and the Financial Secretary, in addition to the Permanent Secretaries. The working of the department is entrusted to the Chancellor of the Exchequer, the Patronage Secretary being responsible for correspondence, and the Financial Secretary preparing the Civil Service Estimates. But the real working of the details depends upon the permanent officials, especially the Financial Secretary (who is also Auditor of the Civil List) and the Administrative Secretary. The Treasury exercises general control where particular provision has not been made, and has special supervision of the Inland Revenue, the Customs, Woods and Forests, and Post Office Departments. It has its own solicitor, who also officiates as Director of Public Prosecutions and King's Proctor; and the Paymaster-General is concerned in distributing pay to the army, navy, etc. The Treasury Bench in the House of Commons is the front bench on the right hand of the Speaker.

Treaty signifies the discussion of terms which immediately precedes the conclusion of a contract or other transaction. A warranty on the sale of goods, to be valid, must be made during the treaty

preceding the sale. In public and international law a treaty is an agreement between the Governments of two or more states. Such an agreement is obviously not enforceable by legal proceedings. In the United Kingdom the power of making treaties with foreign states is vested in the Crown as part of the prerogative of the Sovereign. In some cases, however, treaties made by the Crown are not valid in the Courts of the United Kingdom unless concluded under the powers of an Act of Parliament—for instance, extradition.

Trebelli, ZELIA, singer, was born in Paris in 1838. Her gift of song was manifested while she was quite a child and so fascinated her teacher, Herr Wartel, that he induced her parents to consent to her appearance on the operatic stage. She made a brilliant *début* in Madrid in 1859 in *Il Barbiere*, when Mario played "Almaviva" to her "Rosina." It was then she assumed the stage-name of Trebelli, which was in effect her family name of Gillebert reversed. She carried one European capital after another by storm and finally captured and captivated London in 1862. Her voice was a mezzo-soprano of marvellous beauty and sweetness, of rare flexibility and power, and she was equally at home in light and heavy parts. As an actress her impersonations were replete with charm, and she shone also in oratorio and in the concert-room. She married Geremia Bettini, the tenor, in 1863, but the union was not a happy one. She died at Étretat in France on August 18th, 1892.

Trebizond (Turkish, *TARABEZCÜN*), the capital of a province of the same name, Turkey-in-Asia, situated on the Black Sea, near its south-eastern extremity, 120 miles N.W. of Erzerum. Its importance is due to its position on the great trade-route from Europe to Persia and Central Asia. The town stands on a sloping plateau, and is surrounded by ancient Byzantine walls with picturesque towers. The ancient Greek city of Trapezus was founded by colonists from Sinope about 700 B.C. Pop. (estimated), 35,000.

Tredegar, a town of Monmouthshire, England, on the Sirhowy, 17 miles N.W. of Newport. Its prosperity is due to the iron works and coal mines, both of which industries employ thousands of hands. The principal buildings are the churches of St. George and St. James (both modern), the town hall, the library and the literary institute. Pop. (1901), 18,574.

Tree-Frog, a frog of the amphibian family Hylidæ, widely distributed, and modified for arboreal life. On the last joint of each toe is a sucker, and these enable the frogs to cling to the smooth surfaces of leaves. The common Tree-Frog (*H. arborea*) is found in Europe, though not in Great Britain. It is bright-green in colour, and smaller than the common Frog.

Tree-Worship probably arose from the conception that trees were the residences or embodiments of spirits or deities. Lord Avebury considers that it was general to most of the great races of mankind at a certain stage of mental development. James Fergusson's *Tree and Serpent Worship*, and

E. B. Tylor's *Primitive Culture* are the best authorities on the subject.

Trefoil, a general name for the species of the leguminous genus *Trifolium*, and some allied plants with ternate leaves, especially those which are commonly grown as fodder for cattle. *Trifolium procumbens* is known as "hop trefoil," from the shape of its flower-heads, and certain species of *Lotus* as "bird's-foot trefoil," from the three horizontally-spreading claw-like legumes in an umbel. *Trifolium incarnatum*, through being of comparatively recent introduction into Great Britain, is generally known to farmers simply as "trifolium." [CLOVER.]

Trelawny, EDWARD JOHN, the friend of Shelley and Byron, was born in London on November 13th, 1792, and entered the navy at an early age, and afterwards deserted. He met the poet Shelley at Pisa just before he was drowned (1821), and, when the poet's body was recovered, superintended its cremation on shore and burial at Rome. He was afterwards with Byron in Greece, and subsequently travelled in America. He died at Sompting in Sussex on August 13th, 1881, but his ashes were laid beside the graves of Shelley and Keats at Rome. He wrote *The Adventures of a Younger Son* (1831), a work that has taken classic rank, and *Recollections of the Last Days of Shelley and Byron* (1858), which was republished twenty years later under the title of *Records of Shelley, Byron and the Author*. He sat for the old sea-captain in Sir J. E. Millais' "The North-West Passage," now in the Tate Gallery in London.

Trelawny, SIR JONATHAN, one of the Seven Bishops, was born at Pelynt in Cornwall on March 24th, 1650, and educated at Westminster School and Christ Church, Oxford. He entered the Church and held successively the sees of Bristol (1685), Exeter (1689), and Winchester (1707), but is still better remembered as the hero of the ballad, "And Shall Trelawny Die?" composed in reference to the part which he played along with six Bishops in resisting James II. on the matter of the Declaration of Indulgence. He died at Chelsea, Hampshire, on July 19th, 1721. Though he fills a high place in English history, he had few of the qualifications for a great bishop.

Trematoda, a class of worms, including the "Flukes." They are characterised by the fact that the body consists of a single segment, of a flattened leaf-like form, provided with suckers and generally also with hooks. The mouth leads into a branched alimentary canal, but there is no anus. The nervous system is on the dorsal side of the animal. The animals are hermaphrodite, with one exception. The classification of the order is as follows:—

I. MONOGENETIC—development direct.

1. *Tristomæ*.—Usually three suckers, e.g., *Tristomum*.
2. *Polystomæ*.—Numerous suckers, e.g., *Polystomum*, *Aspidogaster*.

II. DIGENETIC—animals pass through a metamorphosis.

1. *Monostomide*.—One sucker.
2. *Distomide*.—Leaf-like bodies, e.g., *Distomum* (Liver Fluke), *Bilharzia* (the cause of the disease known as hæmaturia).
3. *Gasterostomide*.—Of which the larvæ (*Bucephalus*) live in oysters, &c.
4. *Holostomide*, e.g., *Holostomum*, which is parasitic in birds.

Trench, RICHARD CHENEVIX, Archbishop, was born at Dublin on September 5th, 1807, and educated at Harrow and Trinity College, Cambridge. He took holy orders (1832), and, after being curate to Samuel Wilberforce, became, in 1846, professor of theology at King's College, London. In 1856 he was made Dean of Westminster, and in 1864 Archbishop of Dublin. He died in London on March 28th, 1886. Besides *The Story of Justin Martyr* (1835) and other volumes of poems, he was author of *Notes on the Miracles* (1841), *Notes on the Parables* (1846), *The Study of Words* (1851), *English—Past and Present* (1855), and other less popular works.

Trenck, BARON FRANZ, military adventurer, the son of an Austrian general, was born at Reggio, Calabria, Italy, in 1711. He was obliged to leave the Imperial service on account of misconduct; but, after having been dismissed from the Russian for similar reasons, was allowed to raise and command a regiment of Pandours for Maria Theresa, in the Austrian Succession War. In 1745 he made an unsuccessful attempt to capture the person of Frederick the Great, after which he was tried by court-martial and condemned to imprisonment. After one escape, he was incarcerated at Brunn, in Austria, and there, in October, 1749, poisoned himself. His cousin FRIEDRICH, born at Königsberg in Prussia on February 16th, 1726, had a somewhat similar career. While in the Prussian army he intrigued with the Princess Anelia, and was imprisoned for corresponding with his Austrian cousin. After a short period of service in the Austrian army, he was recaptured and imprisoned at Magdeburg, where he was heavily ironed. After nearly twenty years' captivity he was released, and became a wine merchant at Aix-la-Chapelle. He was guillotined at Paris during the Revolution, on July 25th, 1794, being deemed to be a Prussian spy. Both cousins left autobiographies, but the *Memoirs* of the Prussian Baron is decidedly the more famous book.

Trent, the third longest river of England, rises on the borders of Staffordshire and Cheshire, flows in a south-easterly direction through the former county, then mainly towards the north-east through Derbyshire, Leicestershire, Nottinghamshire and Lincolnshire, and, by its junction with the Ouse, 15 miles W. of Hull, forms the Humber. It has a course of about 150 miles, 25 of which are navigable for vessels of 200 tons. A system of canals connects it with the principal Midland towns. The chief affluents are the Tame and Soar, on the right, and the Dove and Derwent on the left. The

leading towns on its banks are Stoke, Burton, Nottingham, Newark and Gainsborough.

Trent (German TRIENT, Italian TRENTO), a town of Austria, on the left bank of the Adige, in the south of Tyrol, 45 miles E. by N. of Verona. Its embattled walls and towers give it a very picturesque appearance, especially when seen from the north. Its aspect is thoroughly Italian, and Italian is the only language spoken. The cathedral, which ranges in style from the 13th to the 15th century, is supposed to retain some Lombardic work as old as the 7th or 8th century. The 15th-century church of Santa Maria Maggiore was the meeting-place of the celebrated Council (1545-63). The industries include silk-weaving, the quarrying of marble and gypsum, tanning, glass-blowing, sugar-refining, pottery and distilling. Pop. (1900), 24,908.

Trent, THE COUNCIL OF, commonly regarded as the eighteenth Œcumenical Council of the Catholic Church, met at Trent on December 13th, 1545, and, after frequent adjournments and reopenings, was dissolved on December 4th, 1563. A General Council had long been advocated by the more earnest and more liberal-minded among the princes, prelates, and scholars who clung to the old religion, as the most efficacious method of removing real abuses and averting the progress of heresy and schism. Martin Luther, and the Protestant princes who favoured him, had also expressed a desire for such a meeting, though with a far different object in view. The proposal was supported, for his own ends, by the Emperor Charles V.; but, owing to the delays created by the Popes, who feared a diminution of their power, the Council was not opened till the last month of 1545, in the twelfth year of the pontificate of Paul III. It was presided over by three Legates, the Cardinals Del Monte, Cervino della Croce, and Reginald Pole, by whom the committees appointed to prepare subjects for discussion were in all cases chosen and instructed, so that it was soon obvious that the proceedings would be conducted in complete harmony with the Pope's interests. It had been generally hoped throughout Europe that the reformation of the Church "in its head and members" would at once engage the attention of the Council, but the first three sessions were wasted in preliminaries, and when the actual business of the Council began matters of practical importance were subordinated to questions of doctrine. From the outset the decisions on these points ran entirely counter to Protestant views. Thus in the fourth session ancient tradition was declared to be no less binding than the express commands of Scripture, the canonical character of the Apocrypha was maintained, and the Vulgate was received as authentic. The judgments given regarding original sin, justification, and the number, nature, and administration of the sacraments in the fifth, sixth, and seventh sessions, were equally uncompromising. An attempt of the Pope to transfer the assembly to Bologna resulted in its adjournment for an indefinite period (September, 1547), and with the exception of a twelve months' session in 1551, in which the Real Presence, transubstantiation, and

the necessity of penance and extreme unction were affirmed, its debates were not reopened till 1562, in the third year of the pontificate of Paul IV. During the closing sessions some enactments were passed improving ecclesiastical discipline, but the Italian bishops successfully resisted all attempts to introduce sweeping reforms. The decrees regarding Purgatory, the worship of saints, relics, and images, indulgences, and similar matters could not fail completely to alienate all who had any sympathy with the Protestant party. On the whole, it may be said that by its policy at the Council of Trent the Roman Church took up a position which has rendered reunion for ever impossible.

Trenton, the capital of New Jersey, United States, on the left bank of the Delaware, 29 miles N.E. of Philadelphia. The principal buildings are the State capitol, court-house, library, armoury and several educational and charitable institutions. Riverside and Cadwalader are two beautiful parks. It has manufactures of pottery, hardware, bricks and tiles, iron structures, wire cables, carriages, woollens and other textiles. A colossal statue of George Washington marks the site of his victory over the Hessian forces on December 26th, 1776. Pop. (1900), 73,307.

Trephine. An instrument used for the purpose of removing a small portion of the skull with a view to relieving pressure, or dealing with collections of matter, or localised disease affecting the brain.

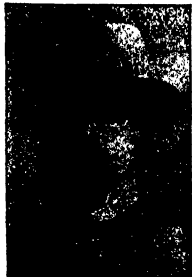
Tretenterata, a subclass of the Brachiopoda or Lamp Shells, comprising those forms in which the valves of the shell are not hinged but held together by muscles, and in which there is an anus. The subclass comprises five families, of which two are extinct, while living representatives of the others are very rare. The best-known genus is *Lingula*, the type of the family *Lingulidae*, which ranges from the Cambrian to the present with extremely slight variations. *Crania*, which lives attached to rocks, mollusca, etc., and ranges from the Ordovician (Lower Silurian), is the type of the *Craniidae*; its shell is small and the free valve is somewhat pyramidal. The other three families are the *Obolidae*, *Trimerellidae* and *Discinidae*.

Trevelyan, SIR GEORGE OTTO, man of letters and statesman, son of Sir Charles Edward Trevelyan (1807-86), Governor of Madras and Indian finance minister, by a sister of Lord Macaulay, was born at Rothley Temple, Leicestershire, on July 20th, 1834. He was educated at Harrow and Trinity College, Cambridge. Entering the political arena, he was elected M.P. for Tynemouth in 1865, for the Hawick Burghs in 1868, and for the Bridgeton division of Glasgow in 1887. From 1868 to 1870 he was a Lord of the Admiralty, from 1880 to 1882 Secretary to the Admiralty, from 1882 to 1884 Chief Secretary for Ireland, and in the latter year entered the Cabinet as Chancellor of the Duchy of Lancaster. For a few months in 1886 he was Secretary for Scotland, a position which he again occupied from 1892 to 1895 in the last Gladstone Ministry. He retired from Parliament in 1897.

Besides some brilliant squibs and light pieces, he is author of *The Competition Wallah* (1864), *Cannepore* (1865), *Life and Letters of Lord Macaulay* (1876), *The Early History of Charles James Fox* (1880), and *The American Revolution* (1905).

Trèves (German, **TRIER**), a city of Rhenish Prussia, on the right bank of the Moselle, 60 miles S.W. of Coblenz. Originally the chief place in the territory of the Treviri, a Teutonic or Celtic tribe, it became a Roman town in the days of Augustus and Claudius, and advanced so rapidly that in the 4th century it is described by Ausonius as "Rome beyond the Alps." The Roman remains are exceptionally numerous and interesting. Among the more noteworthy are the Porta Nigra (an immense gateway, perhaps erected as far back as the 1st century), the basilica, said to have been built by Constantine (now a Protestant church), the so-called "baths" (apparently the remains of an imperial palace), the piers of the eight-arch bridge over the river, which date from 25 B.C., and an amphitheatre outside the town capable of holding 30,000 spectators. To the mediæval period, when Trèves passed under the rule of an archbishop, who was also an Elector of the Empire, belong the cathedral (an interesting example of German Romanesque) and the beautiful Liebfrauen Kirche, erected in the 13th century. In the former is preserved the famous seamless "Holy Coat," said to have been the gift of St. Helena, which, on the occasion of its exhibition in 1891, attracted a vast concourse of pilgrims. The town contains extensive orchards, and carries on a considerable trade in wine, cattle and timber. The industries include iron-founding, tanning, dyeing, and manufactures of stained-glass, furniture and pianos. Pop. (1900), 43,506.

Trèves, SIR FREDERICK, Serjeant Surgeon to Edward VII., was born at Dorchester, Dorsetshire, on February 15th, 1853, and educated at the Merchant Taylors' School and London Hospital. He displayed from the first extraordinary skill and dexterity in operation and was made F.R.C.S. in



SIR F. TRÈVES.

1878. From 1881 to 1886 he was Hunterian Professor of Anatomy and Wilson Professor of Pathology in the Royal College of Surgeons, and from 1891 to 1896 Examiner in Surgery to Cambridge University. For many years he had acted as Consulting Surgeon to London Hospital and in this capacity directed or undertook a unique variety of clinical and other cases. During the Boer war he went to South Africa (1900) as Consulting Surgeon to the Forces in the field and accompanied the Lady-smith Relief Column, for which he holds the medal and three clasps. In 1901 he was created Knight Commander of the Victorian Order and in the following year was promoted Baronet. On

June 24th, 1902, he successfully performed on King Edward VII. the operation for appendicitis, the sudden onset of which had necessitated at the last moment the postponement of the Coronation. In 1906 he was elected Lord Rector of Aberdeen University. Among his textbooks are a *Manual of Operative Surgery*, the classic on the subject, *Intestinal Obstruction* and *Surgical Applied Anatomy* and he is the editor of *A System of Surgery*, which includes articles by his most distinguished confrères. In lighter vein Sir Frederick has written the *Tale of a Field Hospital* (1900), *The Other Side of the Lantern* (1905) and *Highways and Byways in Dorset* (1906).

Trevor, SIR JOHN, judge and Speaker, was born at Brynkinalt, Denbighshire, in 1637 and called to the bar in 1661. By the influence of his patron and cousin, Judge Jeffreys, he was elected Speaker in 1685. In the same year he was also made Master of the Rolls, and after the Revolution became a Privy Councillor. In 1690 he was again chosen Speaker, but on March 16th, 1695, was expelled the House for having received a bribe from the City of London. He was a man of ability, but thoroughly venal, and found congenial employment in "managing" the House of Commons for the Ministry. He died in London on May 20th, 1717.

Triangle is literally a figure possessing three angles, but is often defined as a figure bounded by three lines. In plane geometry these lines are straight, and triangles are classified in accordance with the relations between the sides. When all the sides are equal, the triangle is said to be equilateral; if two are equal, the triangle is isosceles; and when all are unequal it is scalene. A triangle possessing one right angle is said to be right-angled, the side opposite the right angle being known as the

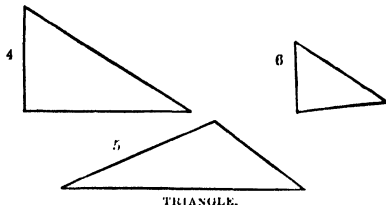


TRIANGLE.

1. Equilateral. 2. Isosceles. 3. Scalene

hypotenuse. When one angle is greater than a right angle, the triangle is obtuse-angled; and when all the angles are less than right angles, it is acute-angled. Since the sum of the three angles is exactly two right angles, it follows that at least two of the angles must always be acute. Plane geometry is, in reality, based upon the properties of the triangle, since the properties of other figures are generally deduced from those of this simplest figure. The longest side of a triangle is always opposite to the greatest angle, and *vice versa*; and the connection between the sides and angles forms the basis of the science of trigonometry. The three lines drawn from the vertices to the mid-points of the opposite sides meet in a point, and

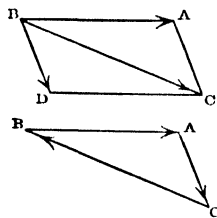
this point is the centre of gravity of the triangle. The three perpendiculars to the sides drawn from the opposite angles also meet in a point which would be the centre of a circle inscribed in the triangle, while the bisectors of the three angles meet at the centre of the circle which passes through each vertex. If one side of a triangle be produced, the exterior angle which it makes with the adjacent side is equal to the sum of the two



4. Right-angled. 5. Obtuse-angled. 6. Acute-angled.

interior and opposite angles, and the three exterior angles (formed by producing the three sides in order) are together equal to four right angles. The area of a triangle is equal to half the product of its base, and the perpendicular from the opposite vertex on this base—or it may be expressed as $\frac{1}{2} \sqrt{s(s-a)(s-b)(s-c)}$, where a, b , and c are the lengths of the sides, and s is half their sum. In a right-angled triangle the square on the hypotenuse is equal to the sums of the squares on the two sides; thus a right-angled triangle can be drawn whose sides are 3, 4, and 5 inches respectively, the squares on the sides being 9 and 16 square inches, while that on the hypotenuse is 25 square inches. In spherical trigonometry triangles are considered whose sides are portions of circles, and these are obtained by drawing figures on a sphere. The simplest spherical triangles are those whose sides are portions of great circles. The geometry of spherical triangles is naturally of much importance, on account of its application in measurements on the earth and in navigation.

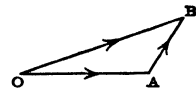
Triangle of Forces is a deduction from the parallelogram of forces, in the article on which it was shown that if two forces acting on a point be represented in magnitude and direction by the lines BA , BD , their resultant is represented by BC , the diagonal of the parallelogram of which BA and BD are the sides. Now the force BC will be exactly balanced by the equal and opposite force, CB ; hence CB will just neutralise the two forces BA and BD ; but BD is equal to AC ; hence CB will just neutralise BA and AC , or the three forces BA , AC , and CB are in equilibrium. These three



TRIANGLE OF FORCES.

forces are completely represented by the three sides of the triangle BAC , and, as the arrow-heads show, they are taken *in order*. Hence it follows that if three forces acting at a point can be represented in magnitude and direction by the sides of a triangle taken in order they will be in equilibrium.

Triangle of Velocities is merely a modification of the parallelogram of velocities (q.v.). Thus if the line OA represents velocity, v_1 , in magnitude and direction, and if from the end A of this line another line, AB , be drawn to represent similarly a second velocity, v_2 , then the line OB of the triangle OAB will represent the resultant of v_1 and v_2 .



TRIANGLE OF VELOCITIES.

Triangulation is the process of dividing any portion of the earth's surface into triangles, from the measurement of which maps may be constructed. The first step in the process is to choose a suitable horizontal line, called the base-line, and to measure it very accurately, a length of about five miles being generally a convenient distance to work with, if the peculiarities of the district will allow the possibility of such a line being obtained. From the ends of this base-line a certain point is observed, the angles between the base-line and the lines joining its ends with the chosen point being measured by a theodolite; the distance of this point is then obtained by calculation. Working in this way, any fixed pair of points can be taken as a new base-line, and so a number of triangles can be built up. In ordinary topographical survey it is usual to select convenient points—such as the peaks of mountains—very far apart, so that large triangles are obtained. These are called primary triangles, and are subdivided into any number of smaller or secondary triangles. The side of a primary triangle may be only a few miles in length, or may exceed 100 miles. When very distant points are to be observed, they are often marked by strong limelight in dull weather, or by some arrangement for reflecting solar rays in sunny lands. The selection of convenient spots in triangulation is not always a very simple matter. Angles as near sixty degrees as possible are the best to measure, greater errors creeping in where calculations are made from very acute angles; the nature of the country, however, often interferes to prevent the possibility of this arrangement, and familiarity with the district in question is the only guide to the selection of the most suitable stations. To prevent the multiplication of errors new base-lines are chosen every now and then, their lengths calculated by continuous triangulation from the old base-line, and then actually measured. If the two results agree, the intermediate survey is accepted as accurate. It must be remembered that the surface of the earth is curved, so that the aid of spherical trigonometry must be invoked in the calculations. This will perhaps be better appreciated by considering the case where the survey of one country is connected

with that of another across the sea—as in the triangulation necessary to connect the survey of England with that of Ireland, and of the Continent—the curvature of a watery surface being more apparent than that of a land covered with irregularities. An important piece of triangulation is that necessary in measuring an arc of the meridian for the determination of the length of a degree of latitude at any place. In this case only a few triangles are necessary, but astronomical observations are made—usually on the sun or the pole-star at certain definite times—in order to fix the position of the meridian itself. [ORDNANCE SURVEY.]

Triassic System, the lowest of the three great systems into which Secondary Rocks are divided, so named from its divisibility into three in the Harz Mountain area, where it was first described. It can generally, however, be better divided into four parts, known (in downward succession) as the Rhenish beds, the Keuper Marls, the Muschelkalk, and the Bunter Sandstein, most of which have been described separately in this work. The Trias is essentially a great series of sandstone, the salt-lake origin of which, at least in its upper portions, is indicated by associated beds of rock-salt and gypsum. Resting commonly horizontally over the folded Carboniferous rocks, it was formerly classed with the Permian as the New Red Sandstone; but in Germany, though less markedly in England, the two are separated by unconformability, and there is a decided difference in the character of their fossils. In England the outcrop of the Trias forms an interrupted band from Exmouth, along the Severn valley towards Derby, where it is divided by the Pennine anticlinal, one half extending westwards over Staffordshire and Cheshire to the mouth of the Ribble, and the other eastwards through Nottinghamshire and Yorkshire to that of the Tees. Deep borings show the Trias to thin-out in a south-eastern direction. The copper of the Keuper, rock-salt, as at Droitwich, and gypsum, are its chief economic products; but in the United States the coal-beds of Virginia and Carolina belong to this period, and coal is often worked from beneath it, as in the Lancashire and Cheshire coalfield. It is one of the best water-bearing series in England, and yields also some very valuable agricultural land. Fossils are mainly confined to the Muschelkalk and Rhenish. Equisetites is the most characteristic plant, and *Ceratites nodosus* the most characteristic cephalopod of the period, in which a certain mingling of Palæozoic and Mesozoic molluscs is noticeable. The amphibian *Labyrinthodon*, the crocodilian *Stagonolepis*, and other reptiles (especially in the Elgin sandstone), footprints possibly avian, and the minute marsupial teeth that form the earliest indication of mammalian life, are the chief other remains of importance.

Tribe, an aggregate of families, more or less closely related. E. B. Tylor says, "Kinship is so thoroughly felt to be the tie of the whole tribe that, even where there has been a mixture of tribes, a common ancestor is often invented to make an imaginary bond of union."

Trichina, a genus of Nematode worms, containing several species, of which *Trichina spiralis* is the best-known. This lives in the muscles of the pig and rabbit, usually occurring in great numbers, and each worm being contained in a small cyst, from about a fiftieth to a seventieth of an inch in length. The worm lies coiled up in the cyst. In this condition the worm is immature, the sexual organs being undeveloped. If meat containing living trichinae is eaten, these develop in about forty-eight hours into mature sexual forms. The males are about one-sixteenth of an inch long, and have two small processes on the tail; the females are nearly twice as large. At the end of a week the females begin to hatch broods of embryos. These are cylindrical in shape and bore through the walls of the intestine into the muscles of the body, where they become encysted. They produce the disease known as trichinosis, which is common in Germany and America, but rare in England. Nothing can be done to the trichinae that have got into the tissues, but the worms in the intestine can be killed off by castor oil, calomel, etc. The chief symptoms of this malady are fever with digestive disturbance, and muscular swelling and pain; dropsy is often present, and hoarseness and difficulty of breathing sometimes occur. The mortality is generally high, and death may occur at the end of three or four weeks.

Trichinopoly, the chief town of a district of Madras, British India, at the head of the delta of the Cauvery, 170 miles S.W. of Madras. The fort stands on a granite peak, 500 feet above the plain. St. John's Church contains the tomb of Bishop Heber (1783-1826). The old Nawab's palace is now utilised for Government offices and St. John's College is a Catholic institution. The town is famed for its cigars and jewellery and has manufactures of hardware, cutlery and saddlery. Pop. (1901), 104,690.

Trichoptera, an order of insects including the Caddis Flies, the members of which are characterised by having four similar wings, which are approximately equal in size. The mandibles are rudimentary, and the larva lives in a case or "caddis tube" made of sticks, shells, etc.

Trieste, the chief port of Austria-Hungary, capital of the *Kustenland* (Coastland) on the Gulf of Trieste, at the head of the Adriatic Sea, 217 miles S.W. of Vienna. The old town consists of narrow, irregular streets, climbing up the sides of a steep hill, on the summit of which is a castle (1508-1680). The cathedral of San Giusto, which belongs chiefly to the 14th century, retains portions of a Roman temple. From the old to the new town runs the Corso, a broad, handsome thoroughfare. The Tergesteo (1840), a magnificent building in the new town, comprises an exchange, reading-room, shops, etc. Other important buildings are the Greek church San Niccolo, the Jesuits' church Santa Maria Maggiore, the Museo Lapidario, Nautical Museum, Municipal Museum of Antiquities, Palazzo Revoltella (painting and sculpture) and the Imperial Academy. Trieste is the headquarters of

the Austrian Lloyd and the Stabilimento Tecnico Triestino. As the principal emporium of the sea traffic of the dual-monarchy, an extensive business is done at the harbour and wharves. Besides shipbuilding there are iron-founding, engineering, brewing, tanning, petroleum-refining, distilling and manufactures of textiles, soap, furniture, oilcloth and wax. Pop. (1900), 178,670.

Triforium, a gallery, or passage, usually in the form of an arcade, above the arches of the nave, choir, and sometimes of the transepts of a church.

Trigonellites, a genus once proposed for some calcareous plates found in the Cretaceous and Oolitic rocks, in association with Ammonites. They are now known to have been parts of Ammonites, formed by calcification of part of the "hood," and used to close the mouth of the shell when the animal is withdrawn into it.

Trigonia, a genus of bivalved mollusca or Lamellibranchiata, which is the type of the family Trigoniidae. The shell is trigonal (triangular or three-cornered) in shape, with a short, rounded anterior side, and long, obliquely-truncated posterior side. The latter is flattened on the upper margin into a specially ornamented "area," part of which is marked off into an "escutcheon." The genus began in the Lias and is most characteristic of the Oolitic rocks. In the Cretaceous species are still abundant, but they are rare in the Tertiary. The only living forms occur in the Australian seas.

Trigonometry derives its name from two Greek words meaning to measure a triangle, and originally that was the object of the science. Now, however, its range is much wider; it deals with angles and their measures, with their geometrical properties, and with algebraical investigations in which they are concerned. Angles are measured in three different ways, according to the unit selected. In the English system a right angle is divided into 90 equal parts, each of which is called a degree, and the degree is the unit of angular measurement. The French divide the right angle into 100 parts, and denote the unit the grade. A third system, however, exists, which does not depend upon any arbitrary mode of division. Thus if O be the centre

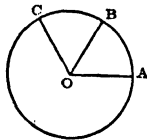


FIG. 1.

of a circle (Fig. 1), and the arc AB be taken equal to the radius OA , the angle AOB is the unit of this system, and is sometimes called a radian. Any angle may be expressed in terms of this unit, and the result will be the circular measure of the angle.

The radian is equivalent to $57.2957 \dots$ degrees. The number of radians contained in any angle

is easily seen to be the length of the arc of any circle subtended by the angle (placed at the centre), divided by the length of the radius of the circle.

Thus the circular measure of $\angle AOC$ is $\frac{AC}{OA}$.

Trigonometrical calculations with regard to an angle are generally made with the use of certain ratios between the sides of a right-angled triangle

containing the angle, these ratios being known as the trigonometrical functions of the angle. In former times, however, these functions had a somewhat different meaning. Let PA be an arc of a circle whose centre is O (Fig. 2). Produce OP ,

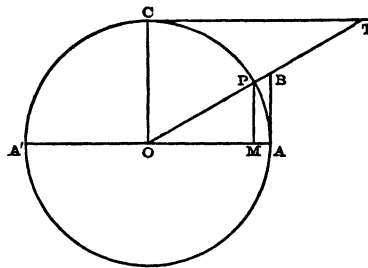


FIG. 2.

draw PM perpendicular to OA , and draw AB , the tangent, at A . Let OC be perpendicular to OA , and let the tangent at C meet OP produced at T . Then PM was called the sine of the arc PA , OM its cosine, BA its tangent, TC its cotangent, OB its secant, OT its cosecant, and MA (or $1 - \cos$) its versed sine. In modern trigonometry these terms are applied to the ratios between the lines of the triangle OPM containing the angle POM . Thus

$\frac{PM}{OP}$ is the sine of the angle POM , $\frac{OM}{OP}$ is its cosine,

$\frac{PM}{OM}$ is its tangent, $\frac{OM}{PM}$ its cotangent, $\frac{OP}{OM}$ its

secant, and $\frac{OP}{PM}$ its cosecant. It is seen that the

lengths of the lines in the old definitions varied with the circle taken, but the modern functions are independent of any radius. If the lengths of the lines representing the old function be divided by the length of the radius of the circle, we see that the old functions of the arc are transformed into the modern functions of the angle. The sine of the angle A is generally written $\sin. A$, and the square of this is denoted by $\sin.^2 A$, similar abbreviations being used for the other functions. The trigonometrical ratios are connected together by the formulæ $\sin.^2 A + \cos.^2 A = 1$, $\sec.^2 A = 1 + \tan.^2 A$, and $\csc.^2 A = 1 + \cot.^2 A$, so that all the ratios of an angle can be expressed in terms of any one of them. The angle POM , the amount by which POM differs from a right angle, is called the complement of POM and POA^1 ; the difference between it and two right angles is called the supplement. The functions of an angle are always the co-functions of its complement, e.g., $\sin. A = \cos. (90 - A)$, while the functions of an angle and its supplement are either equal or differ only in sign.

Geometrically, we can only find the functions of angles of 30° , 45° , 60° , 36° and 72° , but formulæ have been arrived at by which the functions of an angle $A + B$ or $A - B$ can be obtained from the functions of the two angles A and B . It follows that the functions of $2A$, $3A$, etc., and in the same

way $\frac{A}{2}$, $\frac{A}{4}$, etc., can be found, and so the functions of any angle can be obtained. The solution of triangles is an important branch of trigonometry, on account of its application in mensuration and surveying, and different methods are used, according to the data given, a fundamental proposition connecting the sides and angles of any triangle being that the sides are proportional to the sines of the opposite angles. On the more theoretical side, trigonometry concerns itself with the summation of sines, whose terms are related to the trigonometrical ratios, with the expansion of certain expressions, such as the expansion of $\sin. a$ and $\sqrt{\cos. a}$, in series of powers of a (given in circular measure), with the evaluation of π (the ratio between circumference and diameter of a circle), and with innumerable other achievements of mathematical importance. Spherical trigonometry is that branch of the science which is applied to the investigation of triangles drawn upon a sphere, and finds its special application in astronomy.

Trilobites, an order of Arthropoda, all the members of which are extinct and limited to the Palæozoic rocks. The order is of interest from its importance to the geologist, the variety of forms belonging to it, and the doubts as to its correct zoological position. The body consists of three divisions, a head, thorax, and tail or abdomen, which are definitely marked off from one another. It is distinctly trilobed in most genera, there being a raised central area with a lower flat area on either side. The thorax is always composed of a number of separate somites, varying from two in the small *Agnostus* to as many as twenty-six in *Ilarpes*; each somite consists of a central raised axis with a rib-like pleura on either side. The head or cephalic shield is composed of several somites fused together; the central portion or "glabella" is raised, and covers the stomach; on either side are two pairs of plates called the fixed and free cheeks. The free cheeks are often continued backwards into long spines as in *Trinucleus*. On the upper surface of the head are usually a pair of eyes; these are sometimes compound and of great power, and in some there may be as many as 15,000 facets in each eye. On the under surface of the head is a lip-plate or hypostome much like that of *Apus*. The tail or caudal shield or "pygidium" consists of several somites fused into a single plate; it often ends in a point or spire; the anus opens at the extreme end. As regards the structure of the soft parts and organs on the under surface very little is known. As the *Trilobites* could mostly roll themselves up into a ball, like the wood-louse, the appendages are sometimes preserved, but so much displaced that their interpretation is very difficult. It is thought, however, that one or two pairs of spiral gills occurred on each somite under the pleurae of the thoracic region, and that each somite had also a pair of crawling legs with an epipodite or small-jointed appendage attached to each. The systematic position of the *Trilobites* is very uncertain. They have been most generally regarded as Crustacea, though many weighty authorities assign

them to the Arachnida. The latter view is based on their affinities to the *Limulus*, which is now generally regarded as an Arachnid. During the last few years, however, the balance of evidence seems swinging back to the Crustacean view of their affinities, owing to the growth of knowledge of the appendages and the position of the anus. In this case probably their nearest living ally is the genus *Apus*, one of the Phyllopoda. The *Trilobites* are restricted to the Palæozoic rocks, and range from the Cambrian to the Permian; in the Carboniferous they are represented by four genera, while in the Permian there is only a single species of *Phillipsia*. They are most important in the Upper Cambrian and Ordovician. Many of the best-known forms, such as *Calymene blumenbachi*, or the "Dudley Locust," occur in the Wenlock Limestone. The oldest-known genera are *Olonellus* and *Paradoxides*. They are classified into nineteen families.

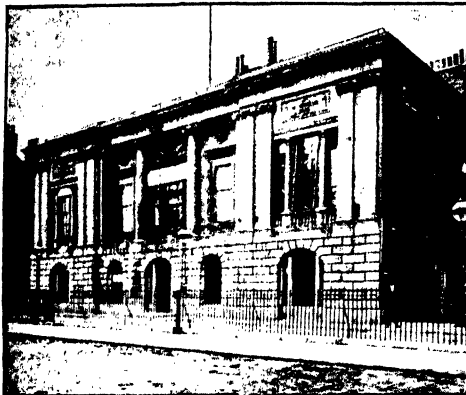
Trimera, a section of the Beetles, or order Coleoptera, including all those in which the tarsus, or last division of the leg, is composed of three joints. The Lady Birds are the best-known examples.

Trincomalee, a town and naval station on the north-east coast of Ceylon, 100 miles N.N.E. of Kandy. It stands on the neck of a bold peninsula, which divides the inner from the outer harbour. The harbour is one of the largest and safest in the Indian seas. In 1622 the Portuguese destroyed the famous Temple of a Thousand Columns and used the materials in constructing a fort. The town was captured from the Dutch in 1795 and with other Dutch possessions in the island was ceded to Great Britain in 1802 by the Treaty of Amiens. Rice, tobacco and palms are grown in the vicinity. Pop. (1901), 13,000.

Trinidad, one of the British West India Islands, the most southerly of the Windward group, between $10^{\circ} 3'$ and $10^{\circ} 50'$ N. and $61^{\circ} 39'$ and 62° W., with an area of 1,754 square miles. Its figure is an almost exact square, but promontories at the north-west and south-west angles enclose the Gulf of Paria, the former approaching within thirteen miles of the coast of Venezuela. Three ranges of mountains, densely clad with forests, traverse the island from east to west, the most northerly reaching a height of over 3,000 feet. The intervening plains and valleys are fertile, and yield an abundant supply of cacao, sugar, coco-nuts, rum, molasses and coffee. The remarkable pitch lake at La Brea is graphically described in Charles Kingsley's *At Last*. Trinidad was discovered by Columbus in 1498 and belonged to Spain till 1797, when it was seized by Great Britain. It is administered by a governor, assisted by nominated legislative and executive councils. Port of Spain (4,500) is the capital. Pop. (1901), 255,148.

Trinity House, on Tower Hill, London, is the headquarters of a corporation, formerly located at Deptford, originating in a society of a partly religious nature, and founded by seamen for their mutual advantage. Henry VIII. granted them a charter in 1514, and similar institutions existed at Hull, Leith,

Newcastle and Dundee. Among the duties of these bodies were the attending to lighting, buoying and pilotage, and they possessed certain rights and privileges. The Houses at Newcastle and Leith



TRINITY HOUSE, LONDON.

(Photo: Pictorial Agency)

still regulate local pilotage, and that of Hull attends to the pilots, lights and buoys of the Humber. The London House superintends the lighting and buoying of England and Wales, and has supervision over the others. In 1836 the Trinity House acquired by purchase all private rights in lighthouses. Among the duties of the House are the licensing of pilots, the removal of wrecks and the administration of certain marine charities. The corporation consists of a Master, a deputy-Master, thirteen elder brethren, eleven honorary elder brethren (who, with the Master, are generally men of high social rank, e.g., the Prince of Wales, W. E. Gladstone, etc.), and an unlimited number of younger brethren. The deputy-Master and elder brethren must have been for four years previous to their election naval commanders or masters who have been for four years upon foreign voyages, and the younger brethren must have belonged to the navy or the merchant service. Committees and sub-committees are appointed for particular purposes, and three members of the House, who must be ex-officers of the mercantile marine, sit as assessors to advise the Court of Admiralty upon nautical points.

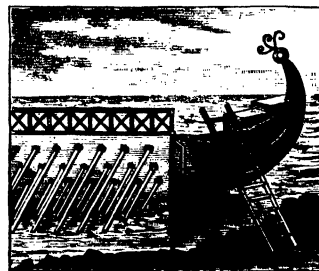
Trinucleidæ, a family of Trilobites, in which the head shield is greatly developed, and the two hinder angles of it are prolonged back as spines. The type-genus *Trinucleus* is most abundant in the Bala beds of North Wales, while the family is entirely restricted to the Silurian and Ordovician systems.

Triple Alliance, (1) a league formed by Great Britain, Sweden and the Netherlands in 1668 against France; (2) another between Great Britain, Holland and France against Spain in 1717; (3) another between Great Britain, Russia and

Austria against France in 1795; (4) an alliance formed between Germany, Austria and Italy in 1883 to check Russia.

Tripoli, a province of the Turkish Empire, bounded on the N. by the Mediterranean, on the E. by Egypt and the Libyan Desert, on the S. by the Sahara and on the W. by Tunis. Its boundaries not having been accurately delimited, its area has been conjecturally estimated, including that of Barca (the sub-province of Benghazi) at 400,000 square miles. Beyond the level tract along the coast, which in the neighbourhood of Tripoli and Misratah is extremely fertile, stretch vast sandy plains, traversed by two rocky chains, with a maximum height of 4,000 feet, which join the Atlas range near Kairwan in Tunis. The rivers are few and small, and the springs often fail. The fertile districts on the coast produce barley, wheat, oranges, lemons, olives, a variety of fruits, wine, cotton, madder, tobacco, etc.; the dates, which grow farther inland, surpass all others in North Africa. The activity of the caravans has diminished owing to the suppression of the slave trade, but large quantities of ivory, gold-dust, esparto grass, goat-skins and ostrich feathers are still exported. The inhabitants are mostly Berbers, with an admixture of Moors, Arabs, Turks, Jews and a few Europeans (mostly Maltese). The region originally formed part of the Roman Empire, became Mohammedan in the 7th century, fell under Turkish dominion in 1714 and in 1835 was proclaimed a vilayet or province of Turkey. Pop. (estimated), 1,000,000, of which three-fifths are assigned to Tripoli and two-fifths to Benghazi. **TRIPOLI**, the capital, is a dirty town, thoroughly Moorish in character, situated on a low rocky promontory, extending into the Mediterranean and forming one side of a small bay. It is famous for its carpets and has also manufactures of woollens, mantles and moreocco and commoner leather. A considerable import and export trade is done at the harbour. Its population is estimated at somewhat more than 30,000.

Trireme, an ancient kind of ship, or rather galley, propelled, as its name denotes, by oars



TRIREME.

arranged in three tiers. The lowest bank of oars was the shortest, and the other two were of proportionately increasing length. In the Persian and Peloponnesian Wars the trireme was the largest

vessel employed, but it was superseded by larger vessels, carrying four and five banks of oars. The Carthaginians and Romans used quinqueremes, and in the battle of Actium (31 B.C.) ships with nine and ten banks of oars were employed. In favourable weather rowing was aided by the use of a square-sail. In the earliest period of the trireme crews tried to grapple and then board the enemy, but the Athenian method was to ram. Twenty sailors, as many soldiers, and a hundred and sixty rowers formed an Athenian crew.

Tristan da Cunha, the chief of a small group of islands in the South Atlantic, in 37° 6' S. and 12° 1' W., roughly midway between the Cape and South America. The surface is mostly rugged and mountainous, with a volcanic cone of 7,640 feet in the centre. It takes its name from the Portuguese navigator who discovered it in 1506. The island has belonged to Great Britain since 1816. Peach and apple trees yield and potatoes do well. A few hundred head of cattle, a few hundred sheep, a few scores of donkeys and some swine are reared. The population has been mainly recruited from shipwrecked persons. The younger inhabitants leave the island when they have the chance and it has been proposed to remove the whole population (75 in 1903) to Cape Colony.

Tristram, or **TRISTAN**, the hero of a Celtic romance, the first extant relic of which dates from the middle of the 12th century. Tristram, a minstrel and nephew of Mark of Cornwall, having been sorely wounded in combat, is cured by the fair Ysande or Yseult, daughter of the King of Ireland. Mark, hearing his account of her beauty, sends him to bring her to Cornwall to be his bride, which she becomes. On their way, however, both Tristram and Ysande had drunk of a love potion, so that their hearts were united for life. Tristram, although afterwards he marries Yseult of Brittany, sends for his old love when he is once again wounded, but dies before her arrival. King Mark, learning their story, buries them in one grave, over which grew, intertwined, a rosebush and a vine. The chief mediæval forms of the story are contained in the German *Tristrant* of Eilhard of Oberge and the *Tristan und Isolde* of Gottfried of Strasburg, the English poem *Tristrem* (about 1300), and the Norse *Tristrams Saga ok Isondar*. Sir Thomas Malory also embodied it in the *Morte d'Arthur*. Italian and Spanish versions appeared in the 16th century, and in more recent days the subject has been again treated by Wagner, Matthew Arnold, and A. C. Swinburne, among others, and by Tennyson in the *Idylls of the King*.

Triton, in Greek mythology, was the son of Poseidon and Amphitrite. His descendants were a kind of merman, accompanied Poseidon, blew on conches, and had for special duty the calming of the sea. In the time-honoured ceremony of "crossing the line," Neptune, when he boards a ship, is followed by Aphrodite and also by Tritons.

Trochee, a foot of two syllables, the first long or accented, and the second short or unaccented.

Trochosphere, the name of a form of larva passed through by many worms and molluscs. It is a small free-swimming body. It consists of a comparatively large lobe in front of the mouth and a long tapering tail; at the base of the lobe is a ring of cilia, while another ring often occurs on the tail. The mouth is on the ventral surface, and leads to a short œsophagus, stomach and intestine; the last opens to the exterior by an anus at the posterior end of the body. The body-cavity of the larva is an archicœle. The body of the adult is formed from the region behind the posterior circle of cilia; the rest of the larva is absorbed or thrown off.

Trochu, LOUIS JULES, general, was born at Le Palais in Belle-Ile-en-Mer, department of Morbihan, France, on March 12th, 1815. Entering the army he won his first laurels in Algeria, commanded a brigade in the Crimea, and at the battle of Solferino (1859) was at the head of a division. He next became Minister of War, but made enemies by the pamphlet (*L'Armée française*) in which he pointed out the weakness of the army under the Second Empire. In the Franco-German War he was Governor of Paris and charged with its defence, a task which proved beyond his capacity. He entered the National Assembly in 1871 as member for Morbihan, but retired into private life next year. He died at Tours on October 7th, 1896.

Troglodytes, or CAVE-DWELLERS (from two Greek words signifying "one who creeps into a hole"), were a primitive race who, like prehistoric man, dwelt in caves, and, as one might expect, were characterised by a low degree of civilisation. They were found in South Egypt and Ethiopia, in the Caucasus and along the lower course of the Danube, and in Asia. From ancient writers we learn that they lived by herding, hunting and robbing, that their language was inarticulate, that they practised community of wives, and that their habits were repulsive.

Trogon, a bird belonging to the Picarian family Trogonidæ, with seven genera, mostly South American, but one genus is African and another Asiatic. They are of moderate size,

with thick puffy plumage of brilliant hues, often delicately banded with white. They are forest-haunting birds, and rarely quit the branches of trees, except to feed on fruit or to seize some insect



TROGONS.

as it darts by. The best-known species is the Quesal or Resplendent Trogon (*Pharomacrus mocino*) from Guatemala, in which "the tail-coverts are enormously lengthened into waving plumes of rich metallic green, as graceful and marvellous as those of the Paradise birds."

Trogontherium, a gigantic fossil beaver of Pleistocene times, the remains of which have been found in the Cromer forest-bed and at Taganrog and Odessa in Southern Russia.

Troll, a Scandinavian mythological term which has been used in different senses. It was originally applied to gigantic supernatural beings, then to witches, but afterwards usually denoted a mountain dwarf with some of the attributes of a brownie and some of a kobold. Despite their thievish propensities, they were endowed with an amiable disposition and had the gift of prophecy and the power of invisibility.

Trollope, ANTHONY, novelist, was born in London on April 24th, 1815, and educated at Harrow. In 1834 he entered the General Post Office and was transferred in 1841 to a position in the Irish branch. From time to time he travelled in America, Egypt and the West Indies in connection with his duties, which he resigned in 1867 in order to give his whole energies to literary work. He had begun writing novels some twenty years before, and had in 1855 first succeeded with *The Warden*. His best works include *Barchester Towers* (1857), *Framley Parsonage* (1861), *Orley Farm* (1862) and *The Last Chronicle of Barset* (1867), with their inimitable pictures of ecclesiastical life. Among other excellent novels were *The Small House at Allington* (1864), *Can You Forgive Her?* (1864), *The Claverings* (1867) and *Phineas Finn* (1869). His *Autobiography* was published after his death, which took place at Harting in Sussex on December 6th, 1882. His elder brother, THOMAS ADOLPHUS TROLLOPE (1810-92), lived chiefly in Italy, and was author of *The Girlhood of Catherine de' Medici* (1856), several novels, and *What I Remember* (1887-9). He collaborated with his wife in *Homes and Haunts of the Italian Poets* (1881).

Trombone (formerly called in England the "sackbut") is a musical instrument of the trumpet kind, consisting of bent tubes, one of which slides upon the other, and ending in a bell mouth. The instrument is held by one hand by means of a cross-piece, and the other hand manipulates the slide. The trombone is a "perfect instrument"—i.e., by means of the slide it produces a full chromatic sequence. Its varieties are treble, alto, tenor and bass, and it is available both for orchestra and military band.



TROMBONE.

Tromp, the name of two great Dutch admirals. (1) MARTIN HARPERTZON TROMP was born at Briel, South Holland, in 1597, entered the navy in 1624, and was promoted lieutenant-admiral in 1637. He

gained his first successes against the Spaniards in the Thirty Years' War. In the first Dutch war with England he was the antagonist of Blake, over whom, on November 30th, 1652, he won a great battle in the Strait of Dover, but the story that he afterwards sailed up the Channel with a broom at his masthead to sweep the English from the seas is probably invented. In the following February he lost a three-days' fight off Portland, and was killed in a battle with Monk on July 29th off the coast of Holland, and was buried at Delft. (2) CORNELIUS TROMP, his second son, was born at Rotterdam on September 9th, 1629, and served under De Ruyter in the second war with England. He was a partisan of William of Orange, who on De Ruyter's death made him head of the Dutch fleet. He gained distinction in the war against France and in the Danish war against Sweden. He was ennobled by Charles II. on his visit to England in 1675 and, in the following year, became lieutenant-admiral of the United Provinces. He died at Amsterdam on May 29th, 1691, and was buried at Delft.

Trona consists of a hydrated acid carbonate of sodium of composition $\text{Na}_2\text{H}_2(\text{CO}_3)_2 \cdot 2\text{H}_2\text{O}$, which occurs as an efflorescence on the soil, chiefly in the neighbourhood of saline lakes in Egypt, Tibet, Asia Minor, Siberia, California and Nevada. It may be obtained crystallised in fine rhombic prisms. Urao, a native name for natron found in the dried-up lakes and river-courses of Venezuela, is a similar compound.

Trondhjem (German, DRONTHEIM), a seaport of Norway, at the mouth of the Nid, on the southern shore of the Trondhjem Fjord, 246 miles N. of Christiania. The streets are broad and regular, with well-built houses, mostly of wood. The cathedral, the most imposing church in the kingdom, dating chiefly from the 12th and 13th centuries, was almost wholly destroyed by a succession of fires, but it has been restored; it is the place of coronation of the kings of Norway. There are a marine arsenal and academy of sciences. The industries include shipbuilding, fish-curing, engineering, distilling, brewing, sugar-refining and the making of cordage and tobacco. Trondhjem, originally Nidaros, was founded by Olaf Trygvason in 996. Pop. (1900), 38,156.

Trophosome, the name applied to the whole of the nutritive zooids or hydranths in such a Hydroid as the Sea-fir or Sertularia.

Tropic Acid, an acid of composition $\text{C}_9\text{H}_{10}\text{O}_3$, which may be obtained in colourless needles, melting at 117°. It is important in the syntheses of many aromatic compounds, and is interesting as a primary product of the decomposition of the alkaloid atropine.

Tropic Bird, a bird belonging to the genus *Phaethon*, type of a family Phaethontidae, with three species, from the tropical parts (hence their name) of the Atlantic and Pacific Oceans. They are known to sailors as "Bo'suns" and may usually be seen following in the wake of ships. In appearance they are tern-like, but the central

tail-feathers are extremely long. The general plumage is white, but in one species (*P. phœnicurus*) the tail-feathers are bright red. These birds have great power of flight and live almost entirely on the wing.

Tropics, the portion of the earth's surface which lies between the tropics (or turning-places) of Cancer and Capricorn, these two parallels marking Cancer the extreme northern and Capricorn the extreme southern limit of the sun's apparent path. The tropics have a great degree of heat and an almost uniform climate, and constitute the torrid zone. The two tropical lines are $23\frac{1}{2}$ degrees north and south respectively of the equator, but their position varies slightly from time to time.

Trossachs (Gaelic, "the bristly territory"), a beautifully wooded pass in south-west Perthshire, Scotland, the romantic scenery of which was immortalised in Sir Walter Scott's *Lady of the Lake*,



TROSSACHS GLEN.

(Photo: Ritchie & Sons, Ltd., Edinburgh.)

published in 1810. The defile is situated 8 miles west of Callander and lies between Loch Achray and Loch Katrine. It is commanded on the north by the granite peak of Ben A'an (1,851 feet) and on the south by green Ben Venue (2,393) of noble contour. In a more conventional sense, due to Scott and the tourists who visit the district from all quarters of the globe, the Trossachs may be described as the area bounded on the N. by the Braes of Balquhiddie, on the E. by Callander, on the S. by Aberfoyle and Loch Ard and on the W. by Inversnaid.

Trotting, as a specially-cultivated pace, is more in vogue in the United States than in the United Kingdom or in Europe, though the best strain of American blood comes from the trotting-horses introduced from the English county of Norfolk. Russia, too, has cultivated trotting. A horse is trained to trot by the use of toe-weights, and is worth in the United States and Canada from £50 to £20,000, according to his breed and degree of excellence in performance. The best blood is descended from a grey stallion called "Messenger," who was imported from England in 1788; and his

descendant "Hambletonian" (champion trotter of 1849) had also a strain of "Bellfounder," who came from Norfolk. At Haarlem in 1806 a speed of one mile in 2 minutes 50 seconds was attained, but in 1891 the mile was covered in 2 minutes $8\frac{1}{2}$ seconds. In 1903, however, this record was beaten, the distance being covered in 1 minute $58\frac{1}{2}$ seconds by "Lou Dillon"; while a pacing mile was covered in the same year in 1 minute $56\frac{1}{2}$ seconds by "Dan Patch."

Trout, a popular name for the smaller fishes of the typical group of the Salmon family, as distinguished from the Charr, the technical difference being that the Salmon and Trout have teeth on the head and body of the vomer, while in the Charr teeth occur on the head of the vomer only. The Common Trout (*Salmo fario*), a well-known food and game-fish, has a wide distribution in the Old World. It is plentiful in the United Kingdom and in the streams and rivers of Northern Europe. The trout, for its size, is more stontly built than the salmon, though without losing its symmetry; the tail is forked in young fish, but in old ones the forking is lost, and the tail becomes square or somewhat rounded. The general ground-colour is yellow, with small spots of black and red on the upper surface, and white or yellowish, with a silvery tinge, beneath. The ground-colour of the upper surface varies greatly, according to the nature of the stream in which the trout live, and to some extent they have the power of assuming the coloration of their surroundings. They are extremely voracious feeders, and nothing in the way of animal food seems to come amiss to them. The principal diet, however, consists of small crustaceans, especially fresh-water shrimps. They also take large quantities of fish-fry, and their habit of rising for flies is well known. The tint of the flesh varies from pink to white, probably from the nature of the food. Trout vary greatly in size, a fish of a pound or a pound and a half being considered a fine one; very much larger specimens, however, are recorded. One taken in Loch Stenness in 1888 scaled 29 lbs.; and in 1894 one was taken in Lough Ennell that weighed 26 lbs. 2 oz., and measured $34\frac{1}{2}$ inches in length and $23\frac{1}{2}$ inches in the middle girth. These exceptionally large fish are by some referred to another species—the Great Lake Trout (*S. ferax*), while others hold that the so-called Great Lake Trout are only abnormally large specimens of the common species. Lochleven has a distinct species (*S. levcenensis*) with pointed pectoral fins. These fish are also bred artificially, and a very large number of fry are hatched out yearly. The Geneva Trout (*S. lemanus*) is closely allied to the Salmon-trout. The close time for trout in England and Wales is from October 2 to February 1, and in Ireland from September 29 to the end of February. In Scotland the close time is from October 15 to February 28. In all three countries, however, there are local variations. America has several species of trout, and the name is there also applied to the Charr.

Trouvère, a mediæval poet who fulfilled in the north of France similar functions to those discharged by the troubadour of Provence. He

travelled from court to court, or castle to castle, chanting his songs of war, and chivalry and love, sometimes attended by a *jongleur*, who improvised an accompaniment for him, and sometimes accompanying himself upon the harp. Taillefer (who fought at Hastings) and Blondel (the friend of Richard I.) were *trouvères*.

Trover (from the French *trouver*, "to find"), a common-law action adopted to try a disputed question of property in goods and chattels. It is called "trover" because it is based upon the supposition (generally a mere fiction) that the defendant found the goods in question, and the allegation is made by the plaintiff that he (the defendant) converted them to his own use (such conversion being the true gist of the action), and damages are claimed for the injury sustained by such wrongful conversion.

Trowbridge, a town of Wiltshire, England, on the Biss, a tributary of the Avon, 8 miles S.E. of Bath. It is noted for its manufactures of kersey-mere, broad and other woollen cloths. The chief buildings are the church of St. James, of which George Crabbe, the poet, was rector from 1814 to 1832 and in the chancel of which he was buried; the town hall; the market house and the high school. All traces of the castle, which was held for Matilda against Stephen, have disappeared, but a mound called Courthill indicates its site. Pop. (1901), 11,526.

Troy. The excavations of Dr. Heinrich Schliemann in the Plain of the Troad in the north-west of Asia Minor, begun in 1870, brought to light a prehistoric town of the Stone Age, which some scholars regard as unquestionably the city of Homer's *Iliad*. Certain critics had rejected the tradition that its remains lay beneath the mound of Hissarlik, which is situated near the southern shore of the Dardanelles, 3½ miles to the north-east of Besika Bay. On digging below the surface of the mound, various remains were discovered, deposited in at least five, probably six strata. Of these there can be no doubt that the uppermost is the *Novum Ilium* of the Romans, rebuilt after 85 B.C. The fifth town (counting downwards) is larger than the two immediately above it, extending over the plain at the base of the mound, which formed the Acropolis. Both the fifth and sixth towns (supposing them to be different) belong to the Stone Age, but there are many indications that before the latter was destroyed the Bronze Age was already approaching. A hoard, which includes a silver jar (containing large gold diadems, with chains, ear-rings, and pendants of the same material), silver daggers, an immense number of small gold rings, and various other relics, were identified with "Priam's treasure" by some who were favourable to Schliemann's views. The town also bears evident marks of destruction by fire, but it cannot have been burnt down by the inhabitants of the Mycenæ discovered by Schliemann, for that is a city of the Bronze, not of the Stone Age, and therefore much later in date than the presumed Troy. Moreover, both the Mycenæ and the Troy of recent explorations differ consider-

ably from the cities described in the *Iliad*. Yet Homer shows an intimate acquaintance with the geographical features of the Troad, and eminent critics still point out that his description exactly suits a strong town built on the Bani Dagh above Bunarbashi. A solution which has been offered is that the poem, which some think the work of ages, embodies various elements, which were derived partly from tradition, partly from contemporary fact.

Troy, capital of Rensselaer county, New York State, United States, on the left bank of the Hudson, 150 miles N. of New York. The Rensselaer Polytechnic Institute is one of the best-equipped in the Union and the Emma Willard Seminary is one of the oldest schools for the higher education of women. Troy has manufactures of shirts, beer, foundry and machine-shop products, paper, optical and other instruments and paints and brushes. Pop. (1900), 60,651.

Troyes, formerly capital of the province of Champagne, and now of the department of Aube, France, on the Seine, 90 miles E.S.E. of Paris by railway. The cathedral of St. Peter and St. Paul was originally founded in 872; the oldest part of the present structure dates from 1206. Henry V. of England and Catherine of France were married in the church of St. John in 1420, a few days after signing the Treaty of Troyes. The abbey of St. Loup contains a museum and a library of some 100,000 volumes, with a large collection of MSS. Cotton, linen and woollen goods are manufactured, and the town is also an important centre for the distribution of the produce of dairies, nurseries and market gardens. Pop. (1901), 53,146.

Troyon, CONSTANT, painter, was born at Sèvres, near Paris, on August 25th, 1810. His father was employed at the famous porcelain and china factory and there Troyon served as a designer for several years. From this branch he gradually passed to landscape and finally to landscapes with animals, and ultimately became recognised as one of the greatest of French animal painters. He died in Paris on February 21st, 1865. Among his chief works are "Le Retour de la Ferme" and "Les Bœufs se rendant au Travail des Champs" in the Louvre, "La Vallée de la Touques," "La Voiture à âne," "Soir d'Été en Normandie," "Le Gué," "Troupeau des Moutons après l'Orage," "L'Abreuvoir" and "Le Chien du Berger."

Troy Weight may have taken its name from Troyes, in France, where a celebrated fair was held, it being customary for many towns to have special weights, some of which became standards in large districts. It was probably brought into England from France in the time of the Black Prince. The name may, however, have been derived from Troynovant, the monks' name for London. There was, however, a pound of twelve ounces in use from very early times—long before the name *troy* was applied to it,—but there were also other pounds, e.g., the merchant's pound (probably giving rise to the *avoirdupois* weight) and the Tower pound. The *troy* pound is mentioned in the reigns of Henry

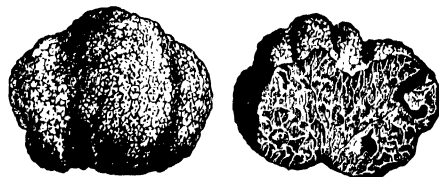
V. and Henry VI., in 1414 and 1423. In 1495 Henry VII. determined to standardise the pound troy, and caused copies of it to be given to knights, burgesses of boroughs, and other important men, "to be by them conveyed to certain cities, etc., appointed for the safe custody of the same" (*Ruding's Coinage of Great Britain*, vol. i, p. 295). But in the next year these weights were found to be wrong, and "it was then ordained that every pound should contain twelve ounces of troy weight, and every ounce twenty sterlings, and every sterling be of the weight of thirty-two corns of wheat that grew in the midst of the ear of wheat, according to the old laws of the land" (*op. cit.*, i. 295, from a statute in the twelfth year of Henry VII.). It was customary for people to take bullion to the mints—of which there were several in olden times—and have it coined on payment of a certain fee, and in these cases either the troy or Tower pound was used. But in a proclamation given on November 5th, in the eighteenth year of Henry VIII., it was ordered that the pound Tower should be no more used, but that all gold and silver should be weighed by the pound troy, "being of twelve ounces, and heavier than the Tower pound by three-quarters of an ounce" (*op. cit.*, p. 305). A fee of two shillings and ninepence was paid for the coining of every pound troy of gold. Before the Conquest we find that the weight of a penny was to be thirty-two corns of wheat, and also that this is the same actual weight as the twenty-four grains troy mentioned in 1280 (Edward I.). The troy grain is, therefore, not the weight of a grain of wheat, but it is found to be the weight of a corn of barley, three grains of barley being equal in weight to four grains of wheat. The troy ounce was raised from the 432 grains troy of the Romans to 480 by the apothecaries, who found that the latter number of grains more easily lent themselves to division into drachms and scruples. The pound troy is divided for precious metals into twelve ounces; each ounce contains twenty pennyweights, each pennyweight twenty-four grains; but for drugs the ounce is divided into eight drachms, each drachm into three scruples, and each scruple into twenty grains. The troy pound and ounce are, however, little used now for medicines, drugs being bought by avoirdupois weight, and only prescriptions being made up by apothecaries' weight. The troy pound contains, as we see, 5,760 grains, while the avoirdupois pound contains 7,000. The use of the pennyweight and grain is gradually dying out, dealers in precious metals having largely adopted the decimal division of the ounce.

Truck System, *THE*, which prevailed largely in mining and manufacturing districts in England till forbidden by law, consisted in paying wages partly in goods instead of money. A master would open stores, and either compel his men to take part of their pay in goods, or at least make it necessary for them to buy their goods at these stores. The objectionable features of the system were the facility it gave to the men to anticipate their wages and the temptation it gave the masters to supply inferior goods. However, any system of credit

seems open to the same objection, and the true remedy would appear to be the establishment of co-operative stores, and this remedy is applied in very many places. The Truck Act of 1831 abolished the system so far as mines and factories were concerned, and an act of 1887 extended its provisions to all workmen save agricultural or domestic servants. Mining tools, fuel, house-room, food prepared under the master's roof, and medical attendance may be provided, but otherwise wages must be paid in current coin.

True Noon is the time of noon given by a chronometer which keeps regular time all through the year. The sun does not keep regular time, the time between two successive noons as indicated on a sundial not being exactly 24 hours. The time indicated by the dial is known as apparent time. The true and apparent noons coincide four times a year—on April 14, June 14, September 1, and December 25. From December 25 to April 14 the true noon arrives before the apparent noon, the greatest difference occurring on February 11, when the chronometer indicates 12 o'clock, while the sundial points to 11 hours 45 minutes 28 seconds. Between April 14 and June 14 the sundial is ahead, and on May 14 the difference is 3 minutes 55 seconds. Between June 14 and September 1 the sundial lags behind, and on July 26 it shows a difference of 6 minutes 12 seconds. From September 1 to December 25 the dial is again in front, so that when the chronometer indicates noon the sundial shows 12 hours 16 minutes 18 seconds p.m.

Truffle is practically the name of all subterranean fungi that are used for food. The truffle of English markets is *Tuber estivum*, one of the



TRUFFLE.

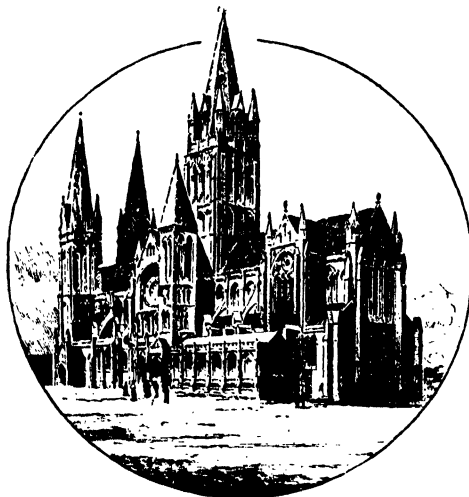
Ascomycetes. It grows under beech, oak, birch, or (rarely) conifers, on clayey or calcareous soil, from July to November, and is black with polygonal warts externally, and brown with white veins internally. Its fragrant smell can often be detected in woods, and dogs are trained to grub it up. Its market value is two or three shillings a pound, it being inferior to the French truffle. This species (*T. melanosporum*) is more globose, browner externally, and blacker internally. It is a winter species, and is to some extent cultivated, the ground under oak-trees in Poitou and Southern France being watered with the spores. The French crop is worth £800,000 per annum. It is this species that is employed in the *pâté de foie gras de Périgord*. The Italian or Piedmontese Truffle (*T. magnatum*) is paler in colour and garlic-scented. The potato-like African Truffle (*Terfezia leonis*) also occurs in

Italy. On the Continent swine are trained to hunt for truffles. The rarer White Truffle (*Chæromyces meandriformis*) is sometimes sold in England; as are also the worthless "Red Truffle" (*Melanogaster variegatus*) and "False Truffle" (*Scleroderma vulgare*), which are puff-balls, *i.e.*, *Gasteromycetes*, and not truly truffles.

Trumpet, a musical instrument of brass, silver, or other metal, consisting of a tube, bent twice upon itself, cylindrical for three-quarters of its length, but opening gradually out for the remaining quarter of its length into a bell mouth. Owing to its shape and the length of the column of air, the trumpet has a peculiarly rich sound, and the many modifications introduced during and since the 18th century, though increasing its compass, have tended to take away the beauty of the sound. These changes have been in the direction of adding pistons, slides and valves. The trumpet is very ancient; the "lituus" was its Roman equivalent and was used for cavalry calls, and the trumpet, without complications, is still used for the same purpose. The modern form of the trumpet dates from the 15th century, and the instrument is very effective in a military band and also for orchestral purposes.

Trumpeter, a bird belonging to the genus *Psophia*, type of a family (*Psophiidae*) of Wading Birds, peculiar to South America. The *Agami* (*P. crepitans*) occurs in small flocks in British Guiana. The popular name refers to the loud call.

Trumpet-Fish, the Bellows-Fish, or Seasnipe (*Centriscus scelopar*). The name is also applied to any of the Flute-mouths.



THE CATHEDRAL OF ST. MARY, TRURO.

Truro, a city of Cornwall, England, $8\frac{1}{2}$ miles N. by E. of Falmouth. It is situated at the confluence of the Kenwyn and the Allen, which run into Truro

River, a northern extension of Falmouth Harbour. The quays are accessible for vessels of 100 tons. Tin and copper ore are exported in large quantities from the neighbouring mines. The diocese of Truro was founded in 1876, Edward White Benson, afterwards Archbishop of Canterbury, being the first Bishop. The Early English cathedral of St. Mary incorporates the south aisle of the old parish church. The grammar school dates from 1546. Pop. (1901), 11,562.

Trust, Trustee. A trust in its simplest form is a relation between two persons by virtue of which one of them (the trustee) holds property for the benefit of the other (the *cestui que trust*), while as regards the outer world he is for most purposes the absolute owner of it. The right of the *cestui que trust* to that benefit is enforceable as a personal right only against the trustee and those who have acquired interests in the trust property with notice of the trust. As between the trustee and *cestui que trust*, and those claiming under them, the *cestui que trust* is in effect beneficial owner of the trust property, either absolutely or with restrictions, according to the nature of the trust. As trusts were formerly enforced only in equity, he is sometimes called equitable owner. This equitable ownership or interest is assignable, except in the case of a restraint on alienation, or anticipation, or of a discretionary trust. By the Statute of Frauds all grants and assignments of trusts must be in writing, signed by the grantor or assignor. No particular form of words is required for an assignment of a trust, but it is the custom to employ the same kind of instrument and the same form of words as if the interest were legal instead of equitable. The devolution of a trust follows the rules of law applicable to a corresponding legal estate or interest. Trust property is liable to be taken in execution, and if the *cestui que trust* becomes bankrupt it vests in the trustee in his bankruptcy. The ownership of the trustee, on the other hand, is not subject to his debts, does not pass to his trustee if he becomes bankrupt, and is not liable to succession duty on his death. Trusts arise either by the act of the party, or by operation of law, *i.e.*, implied. (1) Trusts by act of the party are either expressed or implied. An express trust is one created with clear words, as where A gives property to B in trust for C, or otherwise expresses a clear intention that C shall have the benefit of it. A is called the author of the trust or the settlor, testator, etc., according to the instrument by which the trust is created. (2) An implied trust is where the intention to create the trust is inferred. Thus if A gives property to B, "not doubting," "entrusting," or "hoping" that B will employ it for the benefit of C, a trust is implied in favour of C, the execution of which C can enforce.

Trypsin, the name given to the substance contained in the pancreatic juice which breaks up the proteid constituents of the food.

Tsad, or TCHAD, a freshwater lake of the Soudan, Central Africa, between $12^{\circ} 30'$ and $14^{\circ} 20'$ N., and 13° and $15^{\circ} 10'$ E. Its area, which is some

10,000 square miles during the dry season, increases to 40,000 or 50,000 square miles after the rains. The eastern portion consists of an intricate mass of swampy islands, inhabited by negroes. During the expedition which he conducted across Africa (1904-5) from the Niger to the Nile, Lieutenant Boyd Alexander of the Rifle Brigade surveyed the lake and found that the encroachments of reed banks and marsh in the middle third practically converted it into two lakes. Its chief feeders are, on the west, the Waube or Yo and, on the south-east, the Shari.

Tschaikevsky, PETER ILITSCH, composer, was born at Votkinsk, Russia, on May 7th, 1840. Abandoning the civil service for a musical career he studied at the St. Petersburg Conservatorium. His training over, he produced a variety of works which were nearly all distinguished by intense national sentiment and characteristics, great melody and pronounced originality. Amongst his most admired compositions were the opera of *Eugen Onegin*, the beautiful *Pathetic Symphony*, the "1812" overture and the charming *Sleeping Beauty* and *Casse-Noisette* ballets, in addition to numerous songs. He died at St. Petersburg on November 6th, 1893.

Tse-tse. [SLEEPING SICKNESS.]

Tuaregs (properly *Targui*; plural *Tawarik*), the collective Arabic name of the Berbers of the Sahara, whose real name is Imoshagh. Although now universally adopted by Europeans, the word *Tuareg* dates only from about the 14th century, occurring, under the form *Targa*, for the first time in the writings of Ibn-Khaldun. It is of doubtful origin, though referred by some authorities to the word *erghes*, which means "man" in the Shluh (Berber) dialect of Morocco.

Tuber, a shortened shoot with a swollen stem and small, scaly leaves, usually developed underground, as in the potato and the Jerusalem artichoke. The buds are known as "eyes," and the plant may be reproduced by cuttings of the tubers (then known to growers as "seed-tubers"), each cutting having necessarily at least one eye. Under abnormal conditions the potato-plant will develop green tubers in the axils of its aerial leaves.

Tubercle. [CONSUMPTION.]

Tubercle, a fleshy enlargement of a root resembling a tuber, but without "eyes," as in many terrestrial orchids, the lesser celandine, the bladderwort, and other plants. It serves as a reservoir for reserve-material. In the orchids, for instance, in which it may be rounded or palmate, it is mainly filled by the leaf-activity of early summer and exhausted by the flowering in the succeeding year, by which time another has begun to form.

Tuberosa (*Polygonum tuberosa*), a liliaceous plant of the East Indies, largely cultivated in Southern Europe and in conservatories generally for the sake of its fragrant white flowers. Its tuberous stem sends up an aerial shoot three feet high, with lanceolate leaves and a raceme of funnel-shaped blossoms, each about 1½ inch long, with a

long perianth-tube. In cultivation the flowers are mostly double. It is much grown at Cannes, Grasse, etc., for perfumery.

Tubicola, the tube-bearing worms of the class Chaetopoda. It includes the *Serpula*, which is very common on rocks and shells all round the English coast; in the allied *Spirorbis*, which is abundant on seaweed, the tube is also calcareous, but is coiled in a small disc. In some members of the group the tube is membranous and free, as in *Pectinaria*, and in others it is formed of sand-grains as in *Sabella*. The members of the group are all marine or estuarine.

Tubifex, the Red River Worm, a small worm living in burrows in wet sand and mud in most English rivers, and also in pools. It is about an inch in length, and has a thin, thread-like body. Its correct zoological name is *Senuris tubifex*, though it is often called *Tubifex rivulorum*.

Tübingen, a town of Württemberg, Germany, on the Neckar, 18 miles S.S.W. of Stuttgart. The ducal castle, which dates from the earlier half of the 16th century, overlooks the town; it contains the university library of 200,000 volumes. There is a monument to the poet Uhland, who was a native. The university was founded by Eberhard, 1st Duke of Württemberg, in 1477, and in 1534 accepted the Reformed religion. The "Tubingen School" of theological criticism, notorious for its sceptical tendencies, was founded by F. C. Baur. The manufactures include chemicals and the making of surgical and mathematical instruments, besides printing, dyeing and milling. Pop. (1900), 15,338.

Tubiporidae, a family of Alcyonaria, comprising the Organ-pipe Coral or *Tubipora musica*. No fossil representatives are certainly known, but the Palaeozoic genus *Syringopora* is often regarded as allied to it.

Tucuman, a province in the Argentine Republic, bounded on the N by Salta, on the W. and S. by Catamarca, and on the E. by Santiago, and covering an area of 8,926 square miles. The fertile soil yields large crops of wheat, maize, rice, tobacco and sugar, while cattle and mules are raised in great number. The mineral wealth comprises gold, silver, copper and lead. Tucuman, the capital, has a population estimated at 55,000. Pop. of province (estimated), 270,000.

Tudor, SIR OWEN, ancestor of an English dynasty, was godson of Owen Glendower and was born in North Wales probably about the beginning of the 15th century. He fought at Agincourt under Henry V., whose widow, Catherine, he subsequently married about 1429. On her death he was imprisoned in Newgate, but escaped and fought for Henry VI. against the Yorkists. Having been captured at the battle of Mortimer's Cross, in 1461, he was beheaded. His son Edmund, Earl of Richmond, married Margaret, a descendant of John of Gaunt by Katherine Swynford. Their son became Henry VII. of England.

Tuff, a general term for all fragmentary volcanic rocks, as distinguished from lava, which includes

all the compact ones. Tuffs, therefore, range from the most fine-grained volcanic ashes to the coarsest agglomerate. Tuffs may have consolidated under water, or on land, or not at all, and are generally stratified, and not uncommonly fossiliferous. Felsite-tuff and trachyte-tuff are so named from the rocks by the disintegration of which they have been formed. Palagonite-tuff contains the basalt glass named from Palagonia in Sicily; peperino is a dark-brown earthy tuff in the Alban Hills; trass, a light-coloured variety, quarried for hydraulic cement-making in the Eifel; and schalstein, sometimes at least a diabase-tuff impregnated with carbonate of lime.

Tugela, a river in Natal, South Africa, rising in the Drakensberg Mountains and flowing in an easterly-by-south-easterly direction to the Indian Ocean. Its chief affluents are the Buffalo on the left and the Mool on the right hand. It was the scene of several severe battles (Colenso, Spion Kop and Vaal Krantz) between General Sir Redvers Buller and the Boers in the Boer War (1899 and 1900).

Tula, capital of a government of the same name, Russia-in-Europe, on the right bank of the Upa, 105 miles S. of Moscow. It is celebrated for its imperial gun-factory, and arms are also manufactured extensively by private firms. Tula also produces large quantities of samovars (tea-urns), harmoniums, mathematical instruments and cutlery, and iron-mongery of various kinds. Pop., 111,050.

Tulip (*Tulipa*), a genus of bulbous liliaceous plants, mostly natives of Central Asia, the Levant, and the Mediterranean area. They have triennial bulbs and (except in one Asiatic species) solitary flowers. The six perianth-segments are similar, but in two whorls; the six stamens are free, with erect anthers; and the trilobed stigma is sessile upon the ovary, which forms a many-seeded capsule. *T. suaveolens* of the Caspian is the parent stock of the early-flowering Van Thol tulips; *T. Gesneriana* of Armenia, that of most of the later-flowering kinds. *T. sylvestris*, a form with narrow leaves, and fragrant, pendulous yellow flowers, found apparently wild in English chalk-pits, may be a reversion-form of the latter. In cultivation tulips hybridise and vary freely, so that many hundreds of varieties exist. Over 600 acres of tulips are grown annually in Holland, chiefly near Haarlem, the exports of bulbs and flowers reaching £110,000 per annum. In the 17th century tulip bulbs became the excuse for a remarkable gambling craze known as the tulipomania, when 4,000 florins was paid for a single bulb: scrip was issued for shares in bulbs of supposed great value, and fortunes changed hands over specimens which were sometimes not seen by the buyer or were even non-existent.

Tulip-Tree (*Liriodendron tulipifera*), a lovely North American magnoliaceous tree, fossil representatives of which occur in the Miocene rocks of Europe, whilst an allied species still lives in Central China. It reaches 100 feet to 140 feet in height, having a smooth bark, bright green leaves of a remarkably truncate four-lobed form, with large

deciduous stipules, and tulip-like orange flowers with three reflexed sepals and six petals. The tree grows well in English gardens. In America its wood is used for Indian canoes, and in cabinet-making and coach-building, and it is imported into England under the misleading trade names of "poplar," "white," "yellow" or "Virginian poplar," "whitewood," or "canary whitewood." It takes stains and polishes well, and is, therefore, used in shop-fitting.

Tulloch, JOHN, divine, was born at Bridge of Earn, Perthshire, on June 1st, 1823, and educated at St. Andrews and Edinburgh Universities. He was ordained in 1844 and ten years later was appointed Principal and Professor of Divinity at St. Mary's College, St. Andrews, becoming Principal of the University in 1860. In 1878 he was Moderator of the General Assembly and died at Torquay on February 13th, 1886. He was the most liberal of Presbyterians. In 1864 he published, in answer to Renan, *The Christ of the Gospels and Modern Criticism*, but his most important work was *Rational Theology and Christian Philosophy in the Seventeenth Century* (1872). His last book was *Movements of Religious Thought in Britain during the Nineteenth Century* (1885).

Tumour, a swelling or enlargement, due to the development of new growth in the part of the body affected. It is not usual to include under the term tumour cases of simple hypertrophy of organs, and swellings which result from inflammation or from the diseases known as the infective granulomata (tubercle, lupus, syphilis, leprosy, glanders, and actinomycosis). When the swelling consists of tissue similar to that normally present in the part affected the tumour is said to be homologous, while it is on the other hand termed heterologous when it is made up of embryonic tissue, and is therefore dissimilar to the tissues of its place of development. Tumours are divided into two classes, innocent and malignant. The former are usually homologous, they are often encapsuled, and in their growth they remain readily separable from surrounding structures, into which they do not extend, but which they rather thrust aside. The new formation is thus, as a rule, easily dealt with by operative treatment, it being a simple matter to dissect out the tumour, and when this is completely effected there is no likelihood of recurrence. The growth of an innocent tumour is slow, and it does not cause similar growth in the neighbouring lymphatic glands, or in remote parts of the body. A malignant tumour, on the other hand, increases rapidly in size, and infiltrates the surrounding tissues—that is to say, it extends into them so that it is difficult to say where the new growth ends and sound tissue begins. Again, it often sets up similar growth in the nearest group of lymphatic glands and, it may be, in distant parts of the body. It is hence no easy matter in many cases of malignant disease to remove the morbid tissue, and if this is not effected the tumour usually recurs. Hence the great importance of dealing with malignant growths in their early stages, before the disease has become widely infiltrated, and

before any secondary deposits of the growth have occurred. Innocent tumours may be composed of various kinds of fully-developed tissue, *e.g.*, fatty, fibrous, cartilaginous, osseous, muscular, nervous, and vascular tissues. Malignant tumours consist for the most part of carcinomatous and sarcomatous tumours; the former (the true cancers) are of epithelial origin; the latter are composed of embryonic elements of a connective tissue type, and consist of cells and of a surrounding matrix. According to the shape of the cells which are present, the sarcomata are divided into the round-celled, spindle-celled, mixed-celled, and giant-celled varieties. Cysts are sometimes included under the designation of tumour.

Tun was a measure of volume used for wine and beer, the value differing in the two cases. It is now practically obsolete. [TON.]

Tunbridge, or TONBRIDGE, a town of Kent, England, on the left bank of the Medway, 5 miles N. of Tunbridge Wells. Of the castle, dismantled during the Civil War, only a tower gateway remains in fine condition. The church of St. Peter and St. Paul is Early English and the Grammar School dates from 1553. The town has gunpowder factories, breweries and flour mills and is famous in county annals as a "nursery of cricketers." Pop. (1901), 12,736.

Tunbridge Wells, a fashionable watering-place of Kent, England, 5 miles S. of Tunbridge, situated on the borders of Kent and Sussex. A



THE PANTILES, TUNBRIDGE WELLS.

(Photo: Carl Norman & Co., Tunbridge Wells.)

splendid common adjoins the town and the surrounding scenery, including curious rock formations, is highly picturesque. The chalybeate springs, at the end of the chief parade, called the Pantiles, were discovered by Lord North in 1606. They found favour with Henrietta Maria, Charles I.'s wife, and Catharine of Braganza, queen of Charles II. At the height of their renown they were visited by Dr. Johnson, Sir Joshua Reynolds, David Garrick, Samuel Richardson, Colley Cibber and Mrs. Thrale and still enjoy great vogue. Mount Ephraim and other Biblical names have been handed down from the days of the Puritans, and more recently the town has been a stronghold of the Evangelical party.

Tunbridge Ware—fancy articles and knickknacks of wood inlaid in mosaic—is manufactured, but the prosperity of the town principally depends upon its having become a residential quarter of well-to-do persons attracted to it by its remarkable climate and the beauty of its environment. Pop. (1901), 33,388.

Tungsten (chemical symbol, W; atomic weight, 184), a metallic element, occurring chiefly in the minerals wolfram and scheelite. The metal, which may be obtained by the reduction of the oxide in hydrogen, is of an iron-grey colour, hard, and fusible with difficulty. It is unalterable in air, except in a very finely-divided state. Heated in chlorine, it gives rise to solid, volatile chlorides of considerable chemical interest. It forms two oxides, WO_2 and WO_3 . The last gives rise to a large number of complicated salts, the tungstates. Of these the normal sodic tungstate, $Na_2WO_4 \cdot 2H_2O$, is the most important, being used largely as a mordant in calico-printing and dyeing, and also for rendering cotton and other fabrics fire-proof. The metal when present to a small extent in steel communicates to it great hardness and increases its power of retaining magnetism.

Tungus, one of the main divisions of the Ural-Altaic race, who are scattered in small groups over a vast domain of nearly two million square miles in East Siberia, between the Yenisei River and the Pacific Ocean, and at some points even reaching northwards to the Arctic Ocean. But, excluding the Manchus, the only civilised and settled members of the family, the total population of Tungus speech is estimated at not more than 50,000, and by some authorities as low as 20,000. The chief tribal groups are the Tungus proper ("Reindeer Tungus"), widespread north of the Amur River; Olehas (Manzu), at the mouth of the Amur; Oroks, in the island of Sakhalin; Negdas and Samaghiars, among the northern affluents of the Amur; Orochons, of the Upper Amur; Golds, of the Lower Amur and Ussuri River; Solons and Daur, of the Upper Nonni Basin; Manchus, now mostly assimilated to the Chinese, and the Lamuts, round the shores of the Sea of Okhotsk. The distinctly Mongolic type is marked by high cheek-bones, slant eyes, yellow skin, lank black hair, low stature, great physical strength, extraordinary powers of endurance, keen sense of smell, hearing, and vision, but with a sort of colour blindness, generally confusing blue, green, and yellow. Their intellect is sluggish, but certain moral qualities (courage, generosity, love of truth, hospitality) are so highly developed that Castren has described the people as the "true nobility of Siberia." They are hunters and trappers in the forests, pastors on the steppes and fishers on the shores of seas and rivers. Nearly all are still Shamanists, the very word Shaman being of Tungus origin; even the few official Christians practise Shamanist rites, and polygamy is universal. In the Ural-Altaic linguistic family Tungus is most nearly allied to Mongolian, which it surpasses in wealth of grammatical forms. Tungus (properly Tinghiz) is their Tatar name, adopted by the Russians, but they usually call themselves Boia, "men."

Tunicata, a class of animals forming a sub-phylum of the Chordata, and thus allied to the Vertebrates. It includes the Sea-squirts, such as the Common Ascidian. The animals are degenerate members of the Chordata, in which the notochord is confined to the tail. This appendage only occurs in the larva in most forms. The nervous system is usually reduced to a single ganglion. The animals are simple or colonial, fixed or free, and are hermaphrodite. They are enclosed in a test; the mouth opens to a respiratory pharynx, from which the water escapes by the mouth or an additional aperture. They are all marine. The Tunicates were originally grouped with the Bryozoa and Brachiopods (Lamp-shells) to form the phylum Molluscoidea, supposed to be closely related to the Mollusca. This has now been abandoned from a study of embryology, and the Tunicates are allied to the Vertebrates. The main connection with these is due to the relative positions of the nervous system and the notochord. This is best seen in the order Larvacea, where it is a rod of cartilaginous material lying along the tail. Above it is the nervous cord, which gives off branches to the masses of muscle (or myomeres) on either side of the tail. The same arrangement can be made out in the embryo forms of the other two orders, but during development the tail is reduced, the notochord lost, and the nervous system concentrated into a single ganglion. The structure of a typical Tunicate is described under ASCIDIAN. The classification of the class is as follows:—

I. **LARVACEA**: Simple free-swimming forms, with a tail provided with a notochord, *e.g.*, Appendicularia.



II. **ASCIDIACEA**: Well-developed test; large pharynx.

1. *Ascidie simplices*: Simple or in compound colonies, but each individual has its own test, *e.g.*, the common Ascidian.
2. *Ascidie compositae*: Fixed and colonial, with a common test, *e.g.*, Botryllus (Sea Grapes).
3. *Ascidie salpeformes*: Free-swimming colonies; the only genus is the phosphorescent *Pyrosoma*.

III. **THALIACEA**: Free-swimming barrel-shaped forms with thin test, *e.g.*, Salpa Dolium.

Tuning-Fork, a rod of metal bent into two prongs and supported on a handle fixed at the bend. The fork can be thrown into a state of vibration by hitting it sharply against something hard or by drawing a violin bow across its prongs. The vibration can be seen if the fork be carefully observed, and the motion it sets up in the air can be detected by the hand. A sound is produced as the fork vibrates, and, the vibration becoming less and less in amplitude, the sound gradually dies away, the same note being, however, maintained since the number of vibrations per second remains unchanged, the fork merely moving a shorter distance to and fro as time goes on. The motion of the fork is beautifully shown by Lissajou's figures

and the number of vibrations it makes per second can be experimentally determined by attaching a style to one prong and letting the style just touch a piece of smoked glass, which is allowed to move onwards with a certain known velocity. The number of little undulations made on a given length of the smoked glass [SOUND] measures the vibrations of the fork, and therefore gives the pitch of the note. [PITCH.] When the fork gives its lowest or fundamental note, there are two nodes in the curved portion, and the free ends oscillate about these fixed points. When the fork gives its first overtone there are two other nodes—one in each prong—as well as the two in the bend. [SOUND.] The position of the nodes can be determined by Chladni's method of placing fine sand on the fork and noticing the points at which it accumulates when the fork is made to vibrate. It is a curious fact that two tuning-forks may be in perfect unison when they produce their fundamental note, but their first overtones may be audibly discordant, and *vice versa*. Hermann von Helmholtz discovered that the number of vibrations of the first overtone was not a constant multiple of the number given by the fundamental. The vibrations of the overtone may be rather more or less than six times those of the fundamental. Tuning-forks are used to regulate the pitch of the notes of musical instruments. One fork, usually giving the

note  or , is used to test the accuracy of the corresponding note on an instrument; a musician generally adjusts the rest by ear.

Tunis, nominally a hereditary beylik of the Turkish Empire, but in reality, since 1881, a dependency of France, under the government of a resident-general. It is bounded by the Mediterranean on the N. and E., Tripoli on the S.E., the Sahara on the S. and S.W., and Algeria on the W. It occupies an area of 64,600 square miles. It is traversed by two chains running eastwards from Algeria, the height of the southern in some places exceeding 5,000 feet, whilst that of the northern nowhere reaches 4,000 feet. Between them lies the fertile valley of the Mejerda, the principal river of Northern Africa. The southern chain divides into two branches, separated by a mountainous plateau, from which numerous streams flow in an easterly direction, disappearing in swamps and lagoons, which are usually dry in summer. In the midst of this district stands the ancient city of Kairwan. From Tebessa southwards there is a gradual descent through a series of steppes from the mountainous region to the Sibâkh or salt-marshes, which extend inland from the Gulf of Gabes. Cork woods abound towards the eastern frontier, and the fertile districts produce plentiful crops of wheat, barley, oats, oranges, olives, grapes and other fruit; the dates grown in the Beled Djerid in the south are among the best that find their way to Europe. Live-stock are raised in increasing numbers, and galena, zinc, phosphate, gypsum, potter's clay and marble are mined or quarried. The industries include tanning, the weaving of silk, wool and other textiles, pottery

and carpet-making. TUNIS (pop. estimated at 250,000), the capital, stands on an isthmus between two salt lakes, the outermost of which (that on the north-east) communicates with the port of Goletta by means of a short canal. Besides the mosques and bazaars, the chief attractions are the cathedral built by Cardinal Lavigerie on the site of the ancient citadel, the Chapel of St. Louis (who died in Tunis in 1270), the Carmelite convent and seminary and the Antiquarian Museum. The foundations of the Christian basilica, the Roman theatre, and the amphitheatre in which St. Perpetua and her companions were exposed to wild beasts in 203 may still be seen and the site of Carthage lies a few miles to the north. Pop. of the dependency of Tunis (estimated), 2,000,000.

Tunnel, a way hollowed underground, whether for water passage, as in the case of canals, drains, sewers, and the like, or land passage, as in the case of railways and roads. Among tunnels for water may be noted the Cloaca Maxima of Rome, Claudius's tunnel at Lake Fucino, and the tunnel by which the Bridgewater Canal communicates with the coal-pits at Worsley. But the chief use of tunnels has been in the preservation of, as far as possible, a uniform gradient upon railways when passing through hilly country or beneath a town or river. There comes a time when to make a safe cutting would cost more than tunnelling, and then the latter is resorted to. The usual method is to sink shafts of not less than nine feet in diameter, and to work from each of these, and the difficulty and expense of the work depend upon the nature of the soil to be cut through, both of these being sometimes enormously increased by the occasional occurrence of quicksands or underground water-courses. Often the shafts are kept permanently open for the purpose of ventilation. In cutting through a mountain shafts become impossible, and here ventilation must be artificial. The tunnel of Mont Cenis was begun simultaneously at either end, and the calculations were so true that the two lines of excavation met accurately in the centre. Generally a tunnel is lined with bricks, but in a very solid soil this becomes unnecessary. In the case of the South London Electric Railway, which is tunnel throughout, the two lines pass through iron tubing, and at one point one tube passes over the other. The tunnels and subways beneath the Thames were considered wonderful feats of engineering till eclipsed by that beneath the Mersey and the remarkable tunnel, more than four miles long, beneath the Severn.

Tunny, a fish belonging to the genus *Thynnus* of the Mackerel family, from tropical and temperate seas. There are two dorsal fins, and behind the second dorsal and the anal fin is a row of finlets. The best-known species is the Common Tunny (*T. vulgaris*), abundant in the Mediterranean, whence it ranges to the English Channel and to Tasmania. It is a large fish, specimens of ten feet long and a thousand pounds' weight being recorded, but these are very much above the average size. There is a large tunny fishery in the Mediterranean. The fish are driven into funnel-nets, and when crowded

together in the small end are speared or harpooned. The flesh is valued for food, and large quantities are preserved in oil for exportation. [BONITO.]

Tunstall, CUTHBERT, ecclesiastical statesman, was born at Hackworth, Yorkshire, in 1474; and educated at Oxford, Cambridge and Padua. He became successively rector of Harrow (1511), Master of the Rolls (1516), Dean of Salisbury (1521), Bishop of London (1522), and of Durham (1530). He was much employed as a diplomatist by Henry VIII., whose position in Church matters he accepted. He was appointed a member of Edward VI.'s Council, but was soon deprived and sent to the Tower (1551). Restored by Mary (1554), he was finally deprived by Elizabeth (1559) for refusing the oath of supremacy. He died in Lambeth Palace, virtually an unwilling guest of Archbishop Parker, on November 18th, 1559.

Tupi, the north-eastern division of the Guarani family, who, under a multiplicity of names, formerly occupied a great part of the maritime and Amazonian provinces of Brazil. The chief branches are the Tupi proper of Bahia; the Tapuyos on both sides of the Amazon; the Tupinambas and Tupinambaranas in the Rio Real basin; the Tamimivis and Tamoioes of Rio de Janeiro; the Tupiniquins of Espirito Santo; the Tapiguanes between Pernambuco and San Vicente; the Tappes of Rio Grande do Sul; the Cahetes of the Lower San Francisco; and the Petiguaires of the Parahyba basin. The Portuguese generally extend the term Tupi to all the natives of Tupi Guarani speech. [GUARANI.]

Tupper, MARTIN FARQUHAR, poet and inventor, was born in London on July 17th, 1810, and educated at Charterhouse and Christ Church, Oxford. He was called to the bar in 1835, but never practised. His *Proverbial Philosophy*, published between 1838 and 1876, had great vogue for a time. Tupper, who was elected F.R.S. in 1845, invented glass screw-stops to bottles and safety horse-shoes. He published *My Life as an Author* in 1886. He died at Albury, near Guildford, on November 29th, 1889.

Turbellaria, a class of worm known as the Planarians. They are classified as follows:—

I. RHABDOCELEIDA: small worms, with cylindrical or flat bodies.

1. Acoela, primitive forms, without intestine, and usually without nervous system.
2. Rhabdocœla, forms with a straight intestine, e.g., the parasitic Anoploclium.
3. Alloicœla, forms with a lobed intestine.

II. DENDROCELEIDA, large worms with branched intestines.

1. Tricladida, including the best-known forms, Planaria, Bipalium, etc.
2. Polycladida, forms with a leaf-like body, e.g., Cotylea.

Turbine. [HYDRAULICS.]

Turbot (*Ilombus maximus*), the most highly-valued of the British Flat-fishes. In this genus, to

which the Brill also belongs; the eyes are on the left side; the scales are small or absent, the dorsal fin begins on the snout, and the lateral line takes an almost semi-circular curve above the pectoral fin. The turbot when adult is about two feet long, but larger specimens are recorded. It is fairly common round the British and Irish coasts, and the North Sea is one of the best fishing grounds. One species (*R. maculatus*) occurs on the Atlantic coasts of North America, and another (*R. maritimus*) in the Black Sea.

Turenne, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE, soldier, was a grandson, through his mother, of William the Silent, Prince of Orange, and son of the Duc de Bouillon, and was born at Sedan, France, on September 11th, 1611. Brought up in Holland, he learned war under his uncle, the Stadtholder Maurice. He turned his lessons to good account during the Thirty Years' War, when he won the victory of Casale, and conquered Roussillon (1642) and Bavaria (1647) for France. He was made a Marshal of France in 1644. During the civil wars of the Fronde he at first, impelled by his passion for Madame de Longueville, took part with the nobles; but after his defeat at Rethel (1650), joined Mazarin and became the royal champion against Condé, whom he defeated at the Faubourg St. Antoine (1652) and the Dunes (1658). In 1668 he was appointed Marshal-general of France, became one of Louis XIV.'s most trusted councillors, and again (1672) commanded his armies in the war in Holland. His most brilliant campaign was that of 1674, in which, with greatly inferior forces, he beat the Duke of Lorraine and the Elector of Brandenburg. In the next, in which he was opposed by the skillful Montecuculi, he was killed by a cannon ball at Sasbach in Baden on July 27th, 1675. Though brought up as a Protestant he went over to the Catholic Church in 1668. Napoleon considered him the greatest of modern strategists.

Turgénief, IWAN SERGEIWITCH, novelist, was born of noble parentage at Orel in Russia on November 9th, 1818, and was educated at Moscow, St. Petersburg and Berlin. In 1846 he first became known by his *Annals of a Sportsman*, directed against the evils of serfdom. His liberal opinions resulted in imprisonment and banishment to his estates (1852-5), and for the latter half of his life he lived abroad, first at Baden-Baden and then at Paris, near which, at Bougival, he died on September 3rd, 1883. He especially excelled in the short story, and is thought very highly of by French critics, in whose language many of his works were originally written. Among his earlier tales may be mentioned *A Nest of Nobles* (1858, translated as *Lisa*) and *Helene* (1860, translated as *On the Eve*); of the later, *Smoke*, *Virgin Soil*, and *Annouchka* are among the best. He also wrote poems and dramas. Like Tolstoy, he was pessimist in thought, but had little of Tolstoy's sympathy with the Young Russian movement.

Turgot, ANNE ROBERT JACQUES, statesman, was born at Paris on May 10th, 1727. He was educated at the Sorbonne for the priesthood, but

ultimately entered the service of the State. During the thirteen years (1761-74) that he was Intendant of Limoges he carried out the ideas of the *philosophes*, succeeded in abolishing the *corvée*, introduced the growing of the potato, and did his utmost to meet a famine which lasted two years. In 1766 he published *Réflexions sur la Formation et la Distribution des Richesses*, the best work of the physiocrat school of political economists. On the accession of Louis XVI. in 1774 Turgot became first Minister of Marine and then Controller-General of the Finances. During an administration of less than two years he united against himself, by his attempted reforms, the courtiers, the nobility, the clergy, and the farmers-general; and the king, though he had a great respect for him, was obliged to consent to his dismissal in 1776. He died in Paris on March 8th, 1781. Turgot belonged to the school of Voltaire, and "would have effected the revolution by ordinances" had he been supported. His main objects were the abolition of forced labour (the *corvée*), of interprovincial customs duties of close corporations in towns (*jurandes*), and, above all, of every exemption from taxation. Turgot's life was written by his friend Condorcet in 1786 and both Léon Say and John Morley have dealt with his career and doctrines.

Turin, a city of Northern Italy, formerly the capital of Piedmont, situated a little above the confluence of the Po and the Dora Riparia, 80 miles W.S.W. of Milan. The town, which has a very modern aspect, with broad, regular streets and well-built houses, stands in the midst of a rich and beautiful plain, surrounded by hills, beyond which rise the snow-clad Alps. The cathedral of San Giovanni is a Renaissance edifice, rebuilt in 1498, but San Filippo is the finest of the churches. Of the numerous palaces, the most interesting is, perhaps, the Palazzo Madama, built by William of Montferrat towards the close of the 13th century. The university, founded in 1400, is attended by more than 2,000 students. The manufactures include silk, woollen and cotton stuffs, carpets, paper, pottery, leather, tobacco and wax matches. Turin, a place of considerable antiquity, was sacked by Hannibal and several times captured by France. From 1815 to 1860 it was the capital of the kingdom of Sardinia and of Italy from 1860 to 1865. Pop. (1901), 335,656.

Turkestan ("Land of the Turks"), an indeterminate region of Central Asia extending roughly from the Caspian Sea on the W. to beyond Lob Nor on the E., and from Siberia and Dzungaria on the N. to Persia, Afghanistan, and Tibet on the S. The area is vaguely estimated at 1,200,000 square miles. Western, or Russian, and Eastern, or Chinese Turkestan are separated by the lofty plateau of the Pamir. RUSSIAN TURKESTAN presents very diverse natural features, the western portion consisting of a hollow plain of shifting sands, adjoining the Caspian and the Sea of Aral, whereas that on the east is hilly, with many fertile valleys. In the former division vegetation is to be found only in scattered oases, and along the banks of the rivers, of which the Syr-Daria, or Jaxartes, and Amu-Daria, or Oxus, are

the most important. Politically, Russian Turkestan comprises the provinces of Ferghana (35,446 square miles; pop. 1,151,243), Samarcand (26,627 square miles; pop. 857,905), Syr-Daria (194,147 square miles; pop. 1,479,492), and Semirychensk (144,550 square miles; pop. 988,182), besides the Transcaspian Province (213,855 square miles; pop. 377,416), also Russian, and Afghan Turkestan, consisting of Balkh, Kunduz and Badakshan. The settled inhabitants include Uzbeks (who are mainly agriculturists), Tajiks and Persians; but more than half the population is composed of nomadic Tatar tribes, whose chief occupation is the rearing of horses, mules, asses, camels, cattle and poultry. Much the most important mineral product is salt, which in many places covers the surface of the desert. Cereals, fruits, cotton, hemp, flax and tobacco are grown, and there are manufactures of woollen, silk and cotton textures, shagreen and carpets. The population of Russian Turkestan is estimated at 5,274,238. CHINESE TURKESTAN is bounded on the N. by the Tian Shan Mountains, on the W. by the Pamir, on the S. by the Kuen Lun Mountains and on the E. by the Desert of Gobi. It rises gradually from 4,400 feet at the base of these mountains to 2,200 feet on the shores of Lob Nor, at its eastern extremity. Much of the surface is sterile and, though there are several large towns, the region, as a whole, is sparsely inhabited. In certain parts rice, wheat, millet, pulse, cotton, hemp, flax, the grape, melon, pomegranate and other fruits are cultivated and the rearing of yak and other cattle, sheep, horses and camels is an important industry. Gold, copper, iron, nitre, asbestos, sal-ammoniac, sulphur and jade occur in different localities. Kashgar, the capital, and Yarkand both carry on a considerable trade. Turkish is the language commonly spoken, and the inhabitants are mainly of Tatar origin. The population of Chinese Turkestan is estimated at 1,200,000.

Turkey, a country of south-eastern Europe, eastern Asia and north-eastern Africa, the extent and administration of which were greatly altered by the Berlin Congress of 1878. As now constituted, it comprises (1) Turkey proper, under the immediate government of the Sultan; (2) several tributary and semi-independent states. Turkey-in-Europe is bounded on the N. by Roumania, Servia and Hungary; on the N.W. by Montenegro; on the W. by the Adriatic; on the S. by Greece; and on the E. by the Black Sea, the Sea of Marmora and the Archipelago. The boundaries of Turkey-in-Asia are the Black Sea on the N.; Russian Armenia on the N.E.; Persia on the E.; the Archipelago and the Mediterranean on the W.; and Arabia and the Syrian desert on the S. Turkey is thus a term of political as well as geographical significance.

The most populous towns are:—

	POPULATION.		POPULATION.
Constantinople	- 1,106,000	Aleppo	- 127,150
Danascus	- 230,000	Adrianople	- 81,000
Smyrna	- 201,000	Brussa	- 76,303
Salonica	- 150,000	Kaisarieh	- 72,000
Bagdad	- 145,000	Erzeroum	- 38,900

Area and Population.

	SQUARE MILES.	POPULATION.
I. Turkey Proper {		
In Europe	- 65,350	6,130,200
" Asia	- 608,610	16,898,700
" Africa	- 398,900	1,000,000
	1,157,860	24,028,900
II. {		
Bulgaria and Eastern Roumelia (an autonomous province)	- 37,200	3,744,300
Bosnia, Herzegovina, and Novi-Bazar (administered by Austro-Hungary)	- 19,800	1,501,100
Crete	- 3,330	310,400
Samos (tributary province)	- 180	54,840
Egypt	- 400,000	9,821,100
Cyprus	- 3,710	237,000
	464,220	15,758,740
TOTAL	1,622,080	39,787,640

Physical Features and Climate. The surface of Turkey-in-Europe is for the most part uneven, its mountains being a south-easterly prolongation of the Alpine system. The main branch, comprising the Dinaric Alps and Mount Pindus, runs south-westerly and southwards from Bosnia and Montenegro to Greece, in a line parallel to the shore of the Adriatic and the Ionian Sea. The Balkans, which branch off from this range in an easterly direction, are now situated in the principality of Bulgaria;



SKETCH-MAP OF TURKEY-IN-EUROPE.

but the Despoto Dagh, or Rhodope Mountains (7,464 feet), which form a southern arm of the same chain, are still within the limits of Turkey proper. The Shar Dagh, in Albania, reaches a height of 10,007 feet. The principal rivers are the Maritza, Struma, and Vardar, running southwards to the Archipelago, and the Drin and Voyussa, which fall into the Adriatic. The surface is generally well wooded. There is an abundance of hardy

forest trees, such as the pine, birch and oak, and the palm, maple, myrtle and laurel flourish south of the Balkans. In most parts the temperature changes rapidly from extreme heat to intense cold; but the climate of the Albanian valleys is less variable. The surface of Turkey-in-Asia is more broken than that of Turkey-in-Europe. The ranges of Taurus and Anti-Taurus traverse Asia Minor, sending off branches in all directions, the involutions of which form an endless series of deep gorges, lofty plateaux and mountain-girt plains. From the eastern extremity of Mount Taurus the ranges of Lebanon and Anti-Lebanon run southwards through Syria and Palestine. The Tigris and Euphrates empty themselves into the Persian Gulf, and the Kizil Irmak flows through the northern part of Asia Minor to the Black Sea; but almost everywhere there is a great lack of water, and, as all attempts to preserve the ancient system of irrigation were long ago abandoned, many once fertile districts have for centuries been waste tracts of rock and sand.

Races and Creeds. It is estimated that in Turkey-in-Europe there are about 700,000 Turks and 1,500,000 Albanians. The Greek population probably does not fall far short of the Albanian. The

many Jews and a few Protestants in Armenia and elsewhere.

Government and Political Organisation. The Sultan is an autocrat, but his power is limited on the one hand by the Koran, the *Multeka* (a sacred code embodying the views and judgments of Mohammed and his immediate successors), and the *Cahon-nameh* (a code drawn up by Solymán the Magnificent), and on the other by the authority of the Sheik-ul-Islam, the head of the Ulema, and chief religious dignitary, who may impose a veto on the imperial decrees. The chief political functionary is the *Sdar-azam*, or Grand Vizier, who presides over the *Medjlis-i-Hass*, a privy council of twelve members. Both the *Sdar-azam* and the Sheik-ul-Islam are appointed by the Sultan, who in the latter case must obtain the consent of the Ulema. The empire is divided into *vilayets* or governments, each containing so many *sanjaks* or provinces, the *sanjaks* being subdivided into *kazas*, or districts, the *kazas* into *nahiés*, or subdistricts, and the *nahiés* into smaller areas known as *kariés*. The *vilayets* are administered by governors-general, called *valis*, who are responsible to the Sultan alone, but act with the advice of a provincial council. For each subdivision there is a corresponding official of inferior rank. The *mutessarifs*, who govern the *sanjaks* called *mutessarifats*, are appointed immediately by the Sultan, without the intervention of the *vali*. Of late years both the judicial and the financial powers of the provincial governors have been much curtailed, and the farming of the variable taxes no longer gives scope for unlimited extortion.

Land Tenure, Agriculture, Industries, and Commerce. The soil of Turkey is fertile, but agriculture is in a backward condition, owing, among other causes, to the unsatisfactory system of land tenure, the lack of adequate communication, and the practice of exacting tithe on all produce. The area under cultivation comprises—(1) *miri*, lands held



CONSTANTINOPLE.

other inhabitants are chiefly Serbs, Bulgarians, Wallachians, Magyars, Armenians, Circassians, Gipsies and Jews. Turkey-in-Asia is supposed to contain some 6,800,000 Turks, 4,000,000 Arabs, 1,300,000 Syrians, and 1,000,000 Greeks, in addition to Kurds, Armenians, Circassians, Jews and other races. The number of Mohammedans is said to be 12,000,000 in Asia, 7,000,000 in Africa, and not more than 2,000,000 in Europe. The other inhabitants belong chiefly to one or another of the numerous Eastern Churches [GREEK CHURCH], in addition to which there is a considerable number of Latins or Catholics (acknowledging Papal supremacy), besides

immediately from the Crown and subject to the supervision of Crown officers; (2) *vaconf*, land originally set apart for purposes of religious or educational endowment, but now mostly in the hands of Government officials; (3) *mulkaneh*, hereditary possessions, originally granted as a reward for military service; (4) *mülk*, freehold property, the amount of which is inconsiderable. The products raised on these lands (the area of which is believed to be about 44,000,000 acres) include maize, barley, rice, millet and other cereals; figs, grapes and raisins; cotton, tobacco, olive-oil and sesame and other oil-seeds. The orange.

citron, peach and various other fruit-trees grow abundantly in the Albanian valleys and the more fertile districts of Asia Minor; and the rearing of silkworms is a lucrative industry. The mountain slopes afford excellent pasture, and sheep are bred in large numbers for the sake of their wool. The chief mineral products are iron (which is abundant), copper, sulphur, alum, bitumen, salt, argenteriferous lead-ore and silver (in Asia Minor); some gold is found, and coal is common in certain districts, but is little worked. The manufactures, few of which are exported, include woollen, cotton, and silken fabrics, carpets, shawls, morocco leather goods of various kinds, swords and fire-arms. The fisheries of the Bosphorus are a source of great wealth. The principal exports are tobacco, cereals, fruit (especially figs and raisins), wine, silk, opium, coffee, wool, oil-seeds, skins, valonia, mohair, cotton, carpets, drugs and spices. Cotton and woollen goods figure prominently among imported articles. The length of the railways in 1905 was 3,637 miles (1,239 miles in Europe and 2,398 miles in Asia), and that of the telegraph wires about 42,300 miles.

Army and Navy. The army consists of (1) the Nizam, or regular army and reserves, divided into seven corps of infantry, cavalry, engineers, and artillery; (2) the Redif (Landwehr), comprising twelve army corps; (3) the Mustafiz (Landsturm), the strength of which can be increased indefinitely. The number of officers and men comprising the Nizam probably does not exceed 170,000, but the whole force available in time of war has been estimated at 900,000 or 1,000,000, of which some 600,000 are infantry, and 55,000 or 60,000 mounted troops. All Mussulmans between twenty and forty are liable to service in the field. The navy contains six cruisers, between seventy and one hundred steamers (including a few ironclads of small fighting value) and several torpedo-boats. The number of officers is about 1,000 and of sailors about 30,000.

Education. The educational system, which is closely connected with the Mohammedan religion, was reformed in 1847, and free schools for elementary education are now attached to the mosques. Middle schools have also been provided, and the study of medicine, art, theology, agriculture and other sciences may be pursued in special colleges.

History. The Ottoman Turks, or Osmanlis, are sprung from the Oguzian Turks, who in the 13th century were expelled from their settlements east of the Caspian and driven westwards by the advancing hordes of Mongols. As a reward for services rendered to the Seljuk Sultan of Konieh in his struggle with the Mongols and Chorasmiens, a portion of the tribe was allowed to take possession of lands in Phrygia. After extending their dominion in Asia, they crossed the *Ægean* under Orkhan (1256-9), and seized some of the maritime fortresses of the Eastern Empire. Before the close of the 14th century they had become masters of the larger portion of the empire, the last relics of which disappeared with the capture of Constantinople by Mohammed II. in 1453. The Slavonic provinces in the neighbourhood of the Danube, the northern Adriatic seaboard, the southern, eastern and part of the northern coasts of the Black Sea, Syria, Rhodes

and Egypt were gradually added to their conquests, which reached their farthest limits under Solymán I. (1520-66). During his reign the Turks experienced serious reverses in Hungary, and their subsequent history has been one of continuous decline. They finally resigned all claim to Hungary by the Peace of Karlowitz in 1699. In 1736 they encountered a new danger in the aggressive policy of Russia, and after half a century's warfare they were compelled definitely to abandon all the land they had occupied east of the Dniester (1792). After further hostilities, Russia succeeded in extending her boundary to the Pruth (1812). The Greek struggle for independence (1822-8) was regarded with favour by most of the Continental Powers, and resulted in the formation of Greece into an independent kingdom. It was, however, mainly through foreign intervention that the Ottoman Empire was saved from the ruin which threatened it in consequence of the ambitious designs of Mehemet Ali, Pasha of Egypt (1833). His rebellion was so far successful that it virtually brought Turkish supremacy in Egypt to an end. In 1853 the Tsar found a new pretext for attacking Turkey in his claim to exercise a protectorate over all subjects of the Porte who belonged to the Greek Church. His attempts to enforce his demands brought on the Crimean War, in which Turkey received effectual aid from the United Kingdom, France and Sardinia. It was brought to a close by the Treaty of Paris (1856), which disallowed the Tsar's claims, reinstated the Turks on the banks of the Lower Danube, and excluded all war-vessels from the Black Sea. This latter provision, however, was abolished in the interest of Russia in 1871. In 1861 Moldavia and Wallachia were formed into the principality of Roumania. In 1877 Russia again took up arms against Turkey, nominally for the purpose of preventing the maltreatment of the Christian inhabitants of the empire. The Turks offered a courageous and stubborn resistance, but Russia was eventually successful, and in January, 1878, Adrianople was occupied by her troops. The final outcome of the war was the Congress of Berlin, which rendered Roumania, Serbia and Montenegro independent states, placed Bosnia and Herzegovina under the protection of Austria, rectified the Greek frontier, and handed over a considerable part of Armenia to Russia. Since 1878 the British have occupied Cyprus. In 1897, in consequence of serious disturbances in Crete, war broke out between Turkey and Greece. After a very brief contest, Greece was completely defeated.

Turkey, any species of *Meleagris*, a genus of game-birds, made the type of a family, *Meleagridæ*, or included in the Pheasant family. Turkeys are the largest of the game-birds, and have the head naked, with a caruncle on the bill, bright wattles on the neck and a tuft of long hair on the breast; the tail feathers of the male can be erected. The general plumage is brown, with metallic gloss of blue and green. The Common Turkey (*M. gallopavo*), a native of America, owes its name to a misconception. It was introduced into England in the 16th century, and its home was supposed to be

Turkey, and the error has been perpetuated in its name. It is the largest of British domestic birds, and is highly valued for the table and for its eggs. The hens, however, often lay away from home, and the young birds are difficult to rear. The wild stock ranges from the south of Canada to Florida and Texas, but its limits are rapidly being restricted. Southwards, another species (*M. mexicana*) is found; and in Yucatan and the Honduras is a smaller form (*M. ocellatus*), with brilliant metallic plumage, and eye-like markings on the tail feathers.

Turkey Buzzard (*Rhinogryphus aura*), a vulture, ranging from the southern states of the American Union to the Strait of Magellan. It is about thirty inches long, and in appearance somewhat like a wild turkey.

Turki, the proper national name of the so-called "Tatars, who form the western division of the "Mongolo-Tatar" race. [TATAR.] The term Turk, as an ethnical designation, is traceable, in its mutilated Chinese form (*Tu-ku*), back to the 2nd century B.C., when a people of that name dwelt in the Altai region. Here they gradually rose to great power, and in the 1st century of the Christian era their name had already reached Europe, the Turcs being mentioned both by Pomponius Mela (i. 19) and by Pliny (vi. 7). The Hsiung-nu and the On-Uighurs, founders of vast but unstable empires, were all of Turki stock, as were also the bulk of Attila's hordes: "the Huns, whom we commonly call Turks" (G. Theophanes, 8th century). In 569 Sinjibu, Kha-Khan ("Great King") of the Altai Turks, received an embassy from Justin II. of Constantinople, and ever since that time the Turks, under one name or another, have maintained almost uninterrupted relations, hostile or friendly, with the nations of the West, overthrowing the Byzantine Empire (1453) and penetrating up the Danube to the very gates of Vienna (1683). The Turki type, originally Mongolic, had at an early period been profoundly modified by contact with peoples of Finnish race, whence the frequent mention of "red hair," "green eyes" and "white complexion" in the Chinese records. During their later migrations westwards many (Avars, Magyars, Osmanli) became largely assimilated in physique to the Caucasian type, so that at present most of the western Turks are scarcely to be distinguished from the surrounding Iranian and European peoples of Aryan speech; but their Turki language betrays their Mongol descent, while the Mongolic type itself is still conspicuous amongst the Kirghiz, Siberian Tatars, Uzbeks, most Turkomans, Kashgarians, and Yakuts. In their native steppes the Turki peoples remain essentially nomad shepherds or drovers (Kirghiz, Turkomans, etc.), but in arable lands they have become excellent agriculturists (the settled Turki communities of Persia and Asia Minor). In religion most remain essentially Shamanists, though all, except the Yakuts and a few other "Orthodox Christians," are nominal Mohammedans, whereas their Mongol kinsfolk are, with few exceptions, nominal Buddhists. The Turki language, a typical member of the Ural-Altaic family, is spoken, with

some dialectic diversity, throughout a great part of North-East, Central and Western Asia, in the Balkan Peninsula, the Caucasus, the Volga basin and a few other parts of European Russia. Most of the dialects are uncultivated, but those of the historic peoples (Chagatai, Osmanli, Kazan, Krim and other Russian Tatars) have all been reduced to written form, using the Arabic alphabet, which is ill-adapted for the purpose. The peoples of Turki speech are somewhat thinly distributed over their vast domain of several million square miles, and probably do not number altogether more than about thirty millions. They form the following three distinct groups, with several subdivisions:—(1) EASTERN GROUP, comprising the so-called Tatars of the Yenisei and Siberia, the Yakuts of the Lower Lena basin, with detached settlements on the Sea of Okhotsk; the Taranchi, Machins, Dungans and others of Chinese Turkestan (Kashgaria, Kulja, Dzungaria); the Yegurs and Daldi of Kansu (North-West China). (2) CENTRAL GROUP, comprising the Kirghiz (Kara-Kirghiz or Buruts, Kirghiz-Kazaks and Kara-Kalpaks) of the West Siberian steppes, the Pamir Uplands and Lower Volga; the Hor-pa of the Tibetan plateau; the Uzbeks, Kipchaks, Tiuruks and others of Russian Turkestan, Bokhara, Khiva and Afghan Turkestan; the Bashkirs, Chuvashes, Meshcheriaks and other mixed Finno-Turki peoples of Turki speech in the Volga and Ural basins. (3) WESTERN GROUP, comprising the Turkomans of Transcaucasia, Persia and Asia Minor; the Nogai Tatars of the Caucasus, the Crimea and Kazan; the settled Turki peoples of Azarbaijan (Persia) and Asia Minor; the Osmanli of Turkey-in-Europe.

Turkomans (TURKMENIANS), a large division of the Turki race, whose domain comprises the whole of Transcaucasia between the Oxus and Caspian Sea east and west, and between the Aral Sea and Irania north and south. Turkoman tribes are also scattered in small groups over Afghan Turkestan, Persia and Asia Minor. The chief tribal groups are the Tekke, Goklan, Yomud, Sarik, Saler, Ali-Eli, Ersari, Chandor, with a total population of about 600,000, divided into khalks (tribes), taife (sub-tribes), and tiré (clans), and socially into charwar (nomads) and churmur (settled). From time immemorial they were fierce marauders without any political coherence, but since 1881-2 have been reduced to order under the Russian rule.

Turmeric, the rhizomes of *Curcuma longa*, a perennial herbaceous plant, belonging to the Ginger family, native to Southern Asia. The ovate tubers are the central portion of the first year's growth, and are known as "bulbs"; the long cylindrical "fingers" are lateral growths. Madras turmeric consists of large round pieces; that from Bengal is darker in colour; and that from Java duller. It is always hard and tough, breaks with a resinous fracture, and ranges in colour from orange to brown. It is cultivated in rich, well-watered soil and has long been used as a condiment. In India it is employed as a medicine and is an ingredient in curry powder. It is used as an adulterant of

mustard, but its employment as a dye has ceased. It has an aromatic taste due to an essential oil containing the alcohol turmerol, $C_{19}H_{29}O$, and its colour is produced by curcumin, $C_{14}H_{14}O_4$. This substance, when pure, forms yellow acid crystals, and paper dyed yellow by a tincture of turmeric turns brown on being moistened with an alkali, drying violet. It is, therefore, a common laboratory test for an alkali.

Turn-dun, a small, fish-shaped piece of thin, flat wood, tied to a thong, and whirled in the air to produce a loud roaring noise.

Turner, JOSEPH MALLORD WILLIAM, painter, was born in London on April 23rd, 1775. His father was a barber in Maiden Lane in the parish of St. Paul's, Covent Garden. The boy had very little

riding Polyphemus," in 1838 "Phryne as Venus going to the Bath," in 1839 "The Téméraire" and in 1844 "Rain, Steam and Speed." These marked the highest point of his art. Meanwhile he had also produced *The Rivers of England* (1824) and *The Rivers of France* (1833-5), and had illustrated incomparably Samuel Rogers, Sir Walter Scott and other authors. All his life he had lived alone and wandered about in a mysterious manner, and he died in lodgings at Chelsea under an assumed name on December 19th, 1851. By his will he had intended to provide for the foundation of an asylum for distressed artists, but legal difficulties prevented the carrying out of his wishes. By a compromise with the next-of-kin, however, his pictures in oil and water colour and innumerable sketches went to the National Gallery and a sum of



"THE BAY OF BAÏÆ: APOLLO AND THE SIBYL LEAVING CARTHAGE."

(By J. M. W. Turner, R.A., in the National Gallery, London.)

education, but his artistic gifts soon attracted notice, and he was taken up by Sir Joshua Reynolds and Thomas Girtin. In 1790 he began to exhibit at the Royal Academy, of which he was elected an associate in 1799 and full member in 1802. He very soon secured a good income, but continued to work hard and to live economically all his life. In 1799 he painted the "Battle of the Nile" and in 1802 his picture of "Kilchurn Castle." Up to this time he had travelled much in England. He now began his Continental wanderings, among the results of which were "Calais Pier," "The Vintage at Macon," some Alpine studies and his Venetian pictures. In 1808 he was appointed Professor of Perspective at the Royal Academy, and though his lectures were poor his illustrations of them were invaluable. In 1807 was painted "The Sun Rising in Mist," in 1813 "The Frosty Morning," in 1815 "Dido Building Carthage" and "Crossing the Brook," in 1823 "The Bay of Baïæ," in 1829 "Ulysses De-

£20,000 to the Royal Academy. Robert Chignell, in his able and sympathetic *Life of J. M. W. Turner, R.A.*, discusses and explains the unhappy failure of "Turner's Will." Examples of his admirable etching are to be seen in his marvellous series of the *Liber Studiorum* (1807-19).

Turner, SHARON, historian, was born in London on September 24th, 1768. He became a solicitor, but gave up all his leisure to the pursuit of Anglo-Saxon and other historical studies. The fruits of these labours were seen in his *History of England from the Earliest Period to the Norman Conquest* (1805), *History of England from the Norman Conquest to 1509* (1823), *History of the Reign of Henry VIII.* (1825), and *History of the Reigns of Edward VI., Mary and Elizabeth* (1829). He died in London on February 13th, 1847.

Turner, WILLIAM, divine, physician and botanist, was born in Morpeth, Northumberland, in what

year is not known, and educated at Pembroke Hall, Cambridge. At an early age he began to study botany, of which he may be described as the father in England, his *Libellus de Re Herbaria Norus* appearing in 1538 and his *Neme Herball* in 1551 and 1562. During his travels on the Continent he studied and collected plants and also took the degree of M.D. at Ferrara. On his return to England he devoted himself to clerical work and in 1560 became Dean of Wells. He died in London on July 7th, 1568.

Turnicomorphæ, in Professor Huxley's classification, a name for the Bush Quails.

Turning, the art of shaping various materials in the lathe. If a piece of wood or metal is rotated about an axis, while a cutting tool is held against its surface, portions will be removed until the material is reduced to a circular form. A lathe provides the means for giving this rotary motion to the work. In a modern lathe there is a steel spindle or mandrel, provided with a pulley to which motion is communicated from a fly-wheel driven by a crank and treadle or by steam or other power. This mandrel is fitted in bearings with the greatest nicety, as it is of importance that it shall be able to revolve freely, but be quite unable to move in any other way. The end near the "nose," or screw to which the work is fixed by means of "chucks," runs in a steel collar, and has a conical shoulder to stop end play. In small lathes the other end is supported on a pointed screw, working in a hole in the mandrel, while larger machines usually have a second collar, and a flat-ended screw, working upon the end of the mandrel. In either case the end-shake can be adjusted to be as small as possible. The mandrel and its supports—or the "headstock"—is secured to an iron bed, usually consisting of two bars of iron fixed together at the ends, and accurately made flat and straight. A back centre can slide along the bed and be clamped in any position; it has a steel point, adjustable by means of a screw, which can be used to support the end of long pieces of work. A rest, whose top is shaped like the letter T, can also be fixed to the bed in any convenient position. A "chuck" is used to secure the material to the mandrel, and of these there is an endless variety, adapted to various classes of work. The speed of rotation is a matter of importance. For soft wood it can hardly be too rapid, while for metals it must be comparatively slow; and it is, of course, the peripheral speed which is of consequence, so that the speed of the mandrel must depend upon the diameter of the work. In order that the speed may be adjusted, grooves of various diameters are made on the mandrel and driving pulleys, and for heavy work a "back-gear" headstock is used. In this case the pulley runs freely upon the mandrel, and is connected to it by means of a counter-shaft and gear wheels, so that the speed is much reduced.

Turnip (*Brassica rapa*), a biennial crucifer, which occurs in a wild state in England, but has been in cultivation from ancient times, and has been much altered in the process. The hypo-

cotyledonary axis and crown of the root is enlarged into the so-called bulb, the most important edible portion. Turnips contain 92 per cent. of water and 4 per cent. of pectose, and owe their flavour to a pungent essential oil. They are said to have been cultivated in Flanders in the 15th century, and to have been introduced into England in 1550. In spring the budding shoots are eaten boiled, under the name of turnip tops, and are valuable as an antiscorbutic. The coarser but more nutritious swede, a variety named from the country of its origin, is only grown as cattle-food in the United Kingdom, forming one of the most valuable winter foods for sheep.

Turnspit, a variety of the domestic dog, with long body, and short, generally bent legs, formerly employed to turn spits by walking round inside a wheel, so causing it to revolve. [DACHSHUND.]

Turnstone, a bird belonging to the northern genus *Strepilas*, of the Plover family, so called from their habit of turning over stones with their bill in search of the crustaceans and molluscs on which they feed. The Common Turnstone (*S. interpres*) breeds in Europe as far south as Denmark, visiting Great Britain in winter. It is about nine inches long, with black, white and chestnut plumage.

Turpentine, though originally the name of the oleo-resin of the terebinth, which is still known as Chian turpentine, is now a general name for the oleo-resins of the Conifers. They are yellowish, very viscid, translucent, acid substances, with a strong smell, and burning, bitter, aromatic taste, and consist of various resins dissolved in essential oils which have the formula $C_{10}H_{16}$. By distillation they are separated into rosin or colophony and oil, or spirit of turpentine (known in retail trade as "turps"), a colourless oily liquid, soluble in alcohol, ether, and oils, and acting as a solvent for resins and rubbers. It is largely used in the manufacture of varnish, and in painting. When oxidised in the presence of water it gives off hydrogen peroxide, H_2O_2 , a reaction employed in the manufacture of a valuable disinfectant. The chief European turpentine is that of Bordeaux, obtained by stripping off the bark of the cluster pine, *Pinus maritima* (*P. Pinaster*). In Northern Europe it is obtained from the Northern pine or Scots fir (*P. sylvestris*); in Austria and Corsica from *P. Laricio*. Venice turpentine, used in making sealing-wax, and formerly in veterinary medicine, is the product of the larch, *Larix europæa*, and the less abundant Strasburg turpentine, of the silver fir, *Abies pectinata*. Turpentine is also obtained from the stone pine, *P. pinæ*, the mountain pine, *P. Pumilio*, and the Aleppo pine, *P. halepensis*. In the Southern United States it is the produce of the pitch or swamp pine, *P. australis* (*P. palustris*) and the loblolly pine, *P. Teda*. Canada balsam only differs from other turpentines in being more fragrant.

Turpin, or TILPIN, Archbishop of Rheims in the reign of Charlemagne, was long supposed to be the author of the *De Vita Karoli Magni et Rolandi*, descriptive of Charles's conquest of Spain

and of the exploits and death of Roland. The work is now variously attributed to Pope Calixtus II. and Aimeri Picaud. It is agreed by all critics that the date of composition cannot have been much before the beginning of the 12th century.

Turpin, DICK, robber, was born at Hempstead, Essex, in 1706, and was apprenticed to a butcher in Whitechapel. Being detected in cattle-stealing he took to a career of robbery and general lawlessness, and was finally hanged at York on April 7th, 1739. He confessed to one murder (in addition to the accidental killing of an accomplice) and several burglaries and thefts. The fame of the great ride of York attributed to Turpin by popular tradition really belongs to a highwayman named "Nicks," or "Swift Nick," the *sobriquet* of John Nevison (1639-84).

Turquoise, a bluish-green mineral, obtained chiefly from Persia, where it occurs in reniform masses. It is hard and capable of taking a high polish, being hence prized as a gem when of good colour. Chemically it consists of a hydrated phosphate of aluminium, with traces of copper and iron, to which the colour is due, and possesses a composition represented by the formula $Al_2P_2O_{11} \cdot 6H_2O$.

Turritepas, or PLUMULITES, a genus of fossils from the Ordovician, Silurian and Devonian rocks, of much interest as the oldest-known Cirripedia or barnacles. The best-known specimens come from the Wenlock Limestone of Dudley and the Silurian rocks of Bohemia.

Turritiles, a genus of Cephalopoda belonging to the group of Ammonoids or Ammonites. It differs from the typical representatives of this group in having the shell in the form of a spiral round a central axis. The genus is extinct, and is found only in the Cretaceous rocks.

Turritellidae, a family of Gastropoda or univalve mollusca of which several species are common on the British coasts. The shell is a long coiled spire, and the mouth is rounded and unnotched. The family dates from the Trias, but is most characteristic of the Tertiary period.

Turtle. [TORTOISES AND TURTLES.]

Turtle-Dove, a bird belonging to the genus *Turtur* of the family Columbidae, with about thirty species, all from the Old World. The bill is slender, with the upper mandible slightly bent down at the tip; the wings are long and pointed, and the long tail is rounded or graduated. The Common Turtle-Dove (*T. communis*) visits Great Britain in May, leaving in September. The male is about a foot long, with bluish-grey plumage and the tail-feathers tipped with white. The name is sometimes given to the Collared Turtle-Dove (*T. risorius*), with pale creamy plumage and a black semi-circular mark on the nape. [PIGEON.]

Tuscany, a compartimento or division of North Central Italy, bordering the Mediterranean and comprising the provinces of Arezzo, Florence, Grosseto, Leghorn, Lucca, Massa-Carrara, Pisa and Siena. It occupies an area of 9,304 square miles.

The Apennines traverse the country in the north and north-east and the Arno is the chief stream. The climate, excepting the malarious coastal strip known as the Maremma, is healthy and the soil fertile. The principal products are wine (Chianti and Montepulciano), oil, maize and raw silk and the minerals include iron-ore, copper, lead, mercury, borax and salt. Tuscany formed part of the ancient Etruria, being annexed to Rome in 351 B.C. It played the most prominent part in the revival of art and letters and the Florentine dominions were constituted a grand duchy in 1569. On the extinction of the Medicean dynasty in 1737 it passed under the rule of the house of Hapsburg-Lorraine, but the Grand Duke was deposed in 1860 and next year Tuscany was incorporated in the kingdom of Italy. Pop. (1901), 2,549,142.

Tuscaroras, a North American people, originally of North Carolina, who in 1712 migrated northwards and joined the Iroquois Confederacy as the "sixth nation." Their numbers have dwindled to a few hundreds (743), almost equally divided between Tuscarora Reserve in New York State and Grand River Reserve in Ontario. In the early records of the Carolinas the Tuscaroras are found associated with the historical Pamlico nation, who are now extinct, but whose name survives in Pamlico Sound, Cape Hatteras.

Tusculum, an ancient city of Latium, Italy, on the Alban Hills, about 13 miles S.E. of Rome. Under the Mamilii it became a leading member of the Latin League, but after the battle of Lake Regillus (497 B.C.) the citizens were forced to form an alliance with Rome, to which their descendants remained faithful. In 378 B.C. they received the Roman franchise. Tusculum was a favourite resort of Cicero, who here wrote the *Tusculana Disputations*. Near its site stands the modern town of Frascati.

Tussaud, MARIE, founder of the famous waxwork exhibition, the daughter of a soldier named Joseph Gresholtz, was born at Berne in Switzerland in 1760. She learnt wax-modelling in Paris, and gave lessons to Madame Elizabeth, sister of Louis XVI. About 1794 she married Mons. Tussaud, the son of a wine-grower at Macon, and for six years conducted a Cabinet de Cire, or waxwork show, in Paris. She is said to have been imprisoned under the Terror. Separating from her husband in 1800 she crossed the Channel and set up her show at the Lyceum in the Strand, London. Afterwards it was taken on tour to the principal towns in the United Kingdom, but was established in Baker Street, in London, in 1833. Here she died on April 16th, 1850. The exhibition was removed to its present quarters in Marylebone Road in 1884.

Tusser, THOMAS, musician, farmer and rhymist, was born at Rivenhall, near Witham, Essex, about 1524, and educated at Eton and King's College, Cambridge. He seems to have spent several years in the capacity of chorister and musician and afterwards took to farming, with more or less of ill luck, in Suffolk, Norfolk and Essex. He settled

ultimately in London, where he died on May 3rd, 1580. While living at Cattiwade, Suffolk, he wrote his *Hundredth Good Pointes of Husbandrie* (1557), which was amplified to *Five Hundredth* in the edition of 1573.

Tussock-Grass (*Dactylis cæspitosa*), a grass native to the Falkland Isles, Tierra del Fuego and Southern Patagonia, where it grows in large hummocks, cattle being very fond of its sweet nutty stalks. It has been successfully established in the Hebrides and other parts of the Scottish seaboard.

Twain, Mark. [CLEMENS, S. L.]

Tweed, a river of Scotland, rising in the extreme south-west of Peeblesshire, not far from the Dumfriesshire border. It flows in a north-easterly direction as far as Peebles, where it takes a more easterly course; afterwards bending towards the



THE RIVER TWEED AT DRYBURGH.

(Photo: Wilson, Aberdeen.)

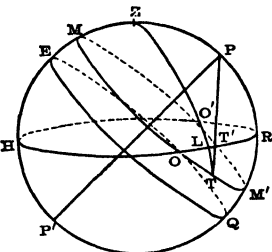
south-east as it traverses the north of Selkirkshire and Roxburghshire, and finally pursues a north-easterly direction through Berwickshire, reaching the North Sea, after a total run of 97 miles, at Berwick, its last two miles being in Northumberland. Its chief affluents, on the left, are the Lyne, Leithen, Gala, Leader, Eden and Leet and, on the right, the Manor, Quair, Ettrick, Teviot and Till. The salmon-fisheries attract anglers, but the river has stronger claims on all lovers of beautiful scenery. It also figures largely in the legendary lore and ballad literature of the Border, and its name is inseparably associated with that of Sir Walter Scott, whose mansion at Abbotsford stands on its southern bank and who was buried at Dryburgh Abbey within sound of its gentle murmur. Melrose, Kelso, Coldstream and Norham are other famous places situated on the river. For some 18 miles it is the natural boundary between England and Scotland.

Twickenham, a town of Middlesex, England, pleasantly situated on the left bank of the Thames, $1\frac{1}{2}$ miles W.S.W. of London. It is a favourite

residential quarter and among more or less distinguished persons who have lived in the vicinity were Alexander Pope, the poet, Horace Walpole (whose mansion of Strawberry Hill has been greatly altered), several members of the Orleans family (at Orleans House), Lord Clarendon the historian, Lord Chancellor Bacon, Sir John Hawkins and the Marquis of Wellesley. Eel Pie Island, an eyot in the river, is a popular resort of boating parties and there is a well-known ferry across the stream. Pop. (1901), 20,991.

Twilight is a lengthening out of the day after the sun has sunk below the horizon, or before he rises above it, and is caused by the reflection of light by the atmosphere. It is the same sort of thing as occurs in mountainous districts, where the peaks reflect light into the valleys when the sun is below the horizon as seen from the valley. It has

been found that twilight will be enjoyed at every place till the sun has sunk 18° below the horizon; if the sun is moving vertically, therefore, he will soon traverse that distance, and the twilight will be of short duration. If, however, he is travelling in a plane cutting the horizon at a much smaller angle, he will take longer to get 18° below it, for he will have to travel farther in his own path, and consequently twilight will last longer. Let $112^\circ P R$ represent the meridian of a place in the northern hemisphere. The circle $110^\circ R O'$ at right angles to the meridian will represent the horizon, and Z will be zenith. If $P P'$ be the axis of the earth, $Z P$ will be 90° minus the latitude of the place, for if $E Q$ be the equator $E Z$ is the latitude. Now, the sun's daily path is in a circle parallel to the equator. During the summer months the circle will be north of the equator, so let $M M'$ represent it, the points O' being the points of intersection of horizon and solar path. Draw an arc, $Z T$, cutting the horizon at L , such that $L T$ is 18° ; then since $Z L$ is, of course, 90° , $Z T$ is 108° . Twilight then lasts while the sun is moving from T to O ; from O to O' the sun is above the horizon, so it is day; from O' to a point T' (corresponding to T) it is evening twilight; and from T' to T it is night. We know the sun's polar distance, $P T$, as we know what days of the year we are considering; $Z P$ is the 90° latitude, and $Z T$ is 108° ,



TWILIGHT.

so we can calculate the angle $Z P T$ by spherical trigonometry. This gives us the time at which twilight will begin; so, knowing the time of sunrise, we can subtract the one from the other and

and the duration of twilight. If $z M'$ were 108° then absolute night would not exist, for twilight would last the whole time from sunset to sunrise. This is the case in the latitude of London during a few nights in June on either side of the longest day. In $48^\circ 30'$ N. there is one night—June 21st—when only twilight exists. In this case the sun has reached his most northern limit, so $M'Q = 20^\circ 30'$, $PR = 48^\circ 30'$, and since $PQ = 90^\circ$ it follows that $RM' = 90^\circ$ minus $23^\circ 30' + 48^\circ 30'$. Hence $RM' = 18^\circ$, which is just the limit of twilight. Below latitude $48^\circ 30'$ there can be no such vanishing night, but in higher latitudes the number of such nights increases, until we get to the point when twilight, too, ceases, and the sun itself shines all night. The length of this continuous day increases as we approach the pole, but is balanced by the continuous night of the winter months. In the tropics the sun rapidly sinks below the horizon, and twilight lasts only about an hour.

Twining, THOMAS, divine, was born at Twickenham, Middlesex, on January 8th, 1735, and educated at Twickenham, Colchester, and Sidney Sussex College, Cambridge. He took holy orders and was successively presented to the livings of Fordham, White Notley (1768) and St. Mary's, Colchester (1788). He died at Colchester on August 6th, 1804. He is best known for his *Treatise on Poetry* (1789), a translation of Aristotle's *Poetics*. He was a good letter-writer, as was made evident by the *Reverations and Studies of a Country Gentleman of the Eighteenth Century* (1882) and *Selections from the Papers of the Twining Family* (1887).

Twiss, SIR TRAVERS, jurist, was born in London on March 19th, 1809, and educated at University College, Oxford, of which he was a fellow and tutor. He was called to the bar in 1840, became Drummond Professor of Political Economy at Oxford from 1842 to 1847, and Professor of Civil Law at Oxford from 1855 to 1870, and held the chair of International Law at King's College, London, from 1852 to 1855. In 1867 he was knighted and appointed Queen's Advocate-General. In 1884 he drew up the constitution of the Congo Free State. He published works dealing with international law, and *Monumenta Juridica: The Black Book of the Admiralty* (1871-6). He died at Fulham on January 14th, 1897.

Tyler, JOHN, tenth President of the United States, was born at Greenway, Virginia, on March 29th, 1790, and educated at William and Mary College, Williamsburg. In 1809 he was called to the bar. From 1811 to 1816 he sat in the Virginian Legislature, in 1817 was elected to Congress, in 1824 became a United States senator and in 1825 Governor of Virginia. He pursued a very independent course both in Congress and in the Senate, and was generally in favour of compromises. In 1836 he had differences with his constituents on the Bank Question. In 1840, however, he became Vice-President of the United States, and less than a year later President on the death of General William Henry Harrison. He vetoed two bills for the re-establishment of the United States Bank, and also two Protective bills. During his term of office the Ashburton Treaty was made and Texas annexed.

In 1861 he endeavoured to mediate between Federals and Confederates, but finally joined the latter. He died at Richmond, Virginia, on January 18th, 1862.

Tyler, WAT, one of five Tylers who took part in the peasant rising in 1381. Wat of Dartford liberated John Ball from Maidstone Gno!, and headed a body of peasants who on June 13th marched into London, killed lawyers and Flemings, destroyed John of Gaunt's Savoy Palace and took possession of the Tower. Wat was struck down by the Lord Mayor, Sir William Walworth, while parleying with Richard II. at Smithfield on the 15th of June.

Tyler, EDWARD BURNETT, anthropologist, was born in London on October 2nd, 1832, and was educated at Grove House School, Tottenham. In 1856 he went with Henry Christy on a scientific tour in Mexico, and in 1861 published *Anahuac, or Mexico and the Mexicans*. It was followed by *Researches into the Early History of Mankind* (1865) and *Primitive Culture* (1871), which placed him in the first rank of anthropologists. This was followed ten years later by a popular handbook, *Anthropology*. In 1871 he was elected F.R.S., and in 1883 became Reader in anthropology at Oxford and keeper of the University Museum. In 1891 he was President of the Anthropological Society, and in 1896 was appointed first Professor of Anthropology at Oxford University. On November 5th, 1907, he was presented with the Huxley Memorial Medal of the Royal Anthropological Institute for his unique services to this branch of science.

Tyndale, WILLIAM, translator of the Bible, was born in Gloucestershire, probably between 1490 and 1495, and studied first at Oxford and afterwards at Cambridge. In 1523 he came to London, but next year left it for Hamburg. Two years later, while at Cologne, he began the printing of his English New Testament. The work was prohibited, but a new edition was executed at Worms, which in 1526 was smuggled into England. By 1530 six editions had been printed, but they were seized by the Church authorities, and copies are now very rare. In the same year an English version of the Pentateuch was printed at Marburg. At Antwerp, where Tyndale spent his last two years in hiding, part of the Old Testament and Apocrypha appeared in English in 1534, and in the next year a revision of the New Testament. In 1535 Tyndale was treacherously seized and, on August 6th, 1536, burnt by order of the Emperor, who had made a treaty with Henry VIII. for the suppression of Lutheran books. According to tradition, he translated the Old Testament as far as the Book of Chronicles while in prison. This portion was printed with the Pentateuch and New Testament in Matthew's Bible. Tyndale's translation forms the basis of the Authorised Version. He also wrote *Obedience of a Christian Man* (1528).

Tyndall, JOHN, physicist, was born at Leighlin Bridge, county Carlow, Ireland, on August 2nd, 1820. After having been an engineer at Manchester, he began his original work while a teacher of mathematics and surveying at Queenwood College in

Hampshire. He studied at Marburg and Berlin, in 1852 was elected F.R.S. and in 1853 was made Professor of Natural Philosophy to the Royal Institution. In 1866 he succeeded Michael Faraday

as scientific adviser to the Board of Trade. In 1874 his address as President of the British Association roused a furious theological controversy. He died from an overdose of chloral, accidentally administered, at Hindhead, Hampshire, on December 4th, 1893. His chief works were *The Glaciers of the Alps* (1860), *Heat as a Mode of Motion* (1863), *On Sound* (1867), *Hours of Exercise in the Alps* (1871), *The Forms of Water in*



JOHN TYNDALL.
(Photo: Bassano.)

Clouds and Rivers, Ice and Glaciers (1872), and *Fragments of Science* (1876 and 1892).

Tyne, a river of England, formed by the junction of the North Tyne (rising in the Cheviots) and the South Tyne (rising in the extreme south-east of Cumberland), two miles above Hexham. From that point it has a course of 30 miles to the sea, for the last 18 of which it separates Northumberland from Durham, its direction throughout being east. Its waters from Newcastle to Tyne-mouth form a single continuous harbour.

Tynemouth, a watering-place of Northumberland, England, situated on the north side of the mouth of the Tyne, opposite South Shields, eight miles E. by N. of Newcastle. North Shields, included in the borough, has a fine sandy beach, nearly a mile in length, which makes it a favourite resort. The pier, which is more than half a mile long, was completed in 1892. Within the castle precincts are the remains of the priory of St. Mary and St. Oswin, consisting chiefly of a church of Norman and Early English date, which are now the headquarters of the Tyne Submarine Engineers. Pop. (1901), 51,514.

Type (Greek, *τύπος* = "a stamp") denotes the small pieces of metal which are arranged in "formes" to impress letters upon paper and other substances, the end of which is presented to the paper having the letter cut or cast upon it in reverse. A fount of type comprises 227 characters; and besides the simple letters of various kinds there are combinations known as "ligatures" and "logotypes." Types are also classified as "shorts," "ascenders" (where a part rises above the general level of the line), and "descenders" (where a part extends below this level). In setting up type, the spaces between words and lines are preserved by the insertion of small blocks and strips of metal. The

width of type differs considerably, and the size of letters is divided generally into the following nine classes:—English, Pica, Small Pica, Long Primer, Bourgeois, Brevier, Minion, Nonpareil and Pearl; and there are other sizes. The metals used by type-founders are tin, antimony, copper and lead, but most founders have their particular secrets. Antimony and copper have a tendency to harden the type and to give it a sharp outline, while tin imparts durability. The earliest material for making type was wood. The chief processes of founding are cutting the punch which forms the letter, sinking the matrix, mixing the metals, casting the type, finishing and dressing it. Casting-machines and other inventions have much lessened the labour of founding. The earlier kinds of type were the Gothic character (still in use in the majority of German books), the Roman (adopted in 1470), and the Italic or sloping type (1501). The Aldine editions are printed in this type, but it is now chiefly used for emphasising or drawing special attention to words. William Caxton employed Flemish type, and English printers generally went to one or other foreign country for their type. But in the middle of the 16th century an English foundry was started. Although in Tudor times Roman type was used for devotional books, yet black letter was slow to go out of fashion. It had, however, passed away before the dawn of the 17th century. Elzevir, Baskerville, and Didot type were characterised by their roundness and clearness.

Type Metal consists of an alloy of 2 parts lead, 1 part tin, and 1 part antimony. It is readily fusible, and expands slightly on solidification, so that it is well adapted for casting and copying moulds, while it is hard enough to withstand the wear of the printing.

Type-Writer, or **WRITING-MACHINE**, a mechanical arrangement whereby the pressure of the finger on a series of keys is made to print characters on a sheet of paper. In most of the numerous patterns the types are fixed to a series of levers, and by other levers the downward motion of the keys causes the type to strike the paper. A piece of ribbon soaked in an ink which is permanently damp is interposed between the type and the paper, and arrangements are made for advancing it as each letter is printed. The paper is held between rollers covered with rubber, and moves transversely a certain distance after each key has been depressed, and the action of replacing the carriage holding these rollers at the completion of a line causes them to rotate a little, thus advancing the paper for the next line. The various machines differ principally in details, and in the relative position of the parts.

Typhlitis, inflammation of the cæcum, with pains in the right iliac fossa, and constipation.

Typhlosole, a ridge running down the interior of the intestine in many worms and Ascidians, and in some fish (such as the Cyclostomes), whereby the area of the wall of the intestine is increased.

Typhoid Fever, or **ENTERIC FEVER**, a malady characterised by a condition of inflammation affecting the lymphoid glands of the intestines, and accompanied by a state of continuous fever, and usually by the development of a characteristic rash. The disease is widely distributed throughout the globe, and has probably prevailed from early times, but it is only within recent years that it has been distinguished from typhus fever, the distinction between these two maladies being finally established by Sir William Jenner about the middle of the 19th century. The incubation period of enteric fever is of somewhat variable duration, but usually covers about a fortnight. The early symptoms are rise of temperature, headache, vomiting and diarrhoea, with pain and tenderness on the right side and lower part of the abdomen. The tongue becomes coated with fur, and tends to get dry; and there may be delirium, especially at night-time. At the beginning of the second week from the commencement of symptoms the rash appears; it consists of slightly elevated rose-coloured spots which disappear on pressure, and which are mainly developed on the abdomen, chest and back. These spots come out in successive crops, each of which lasts for a few days; in some instances the rash is very scanty, and it may be altogether absent. As the disease progresses the abdomen becomes swollen, and pain and tenderness in the right lower abdomen are more marked, the edge of the spleen can usually be felt just beneath the ribs on the left side, diarrhoea is generally present, and the stools tend to assume what is known as the pea-soup character. In some instances recovery now gradually ensues; in others what is known as the typhoid condition becomes developed, the fever remaining high, the pulse rapid and feeble, and a condition of prostration accompanied with drowsiness and delirium supervening. The lips are now often covered with sordes, and blood sometimes appears in the stools. Recovery may still take place, but in the more severe cases the patient passes into a condition of coma and dies. Even in favourable instances recovery from the disease is a tedious process, and relapses are liable to occur. In most attacks of enteric fever the lungs are to some extent affected by bronchitis; sometimes this condition severely aggravates the malady and actual pneumonia may be developed. Bleeding from the bowel is a symptom which is not infrequent during the third and fourth weeks of the disease; it is commonly associated with the process of ulceration which is in progress in the intestine, and the loss of blood may in some cases be so great as to cause death. When the wall of the intestine becomes completely eaten through by ulceration, perforation is said to occur, and peritonitis results. This complication is almost invariably fatal, and is usually made evident by the sudden onset of intense pain in the abdomen, with vomiting and collapse. Numerous sequelæ of the disease have been observed: bed-sores are apt to form, thrombosis of the veins may be developed, and ulceration of the larynx sometimes occurs. The mortality among persons attacked is

usually about 15 or 16 per cent. The condition of the intestines in typhoid fever is the most characteristic lesion in that malady. The masses of lymphoid tissue in the lower part of the small intestine are particularly involved. The solitary glands and the agminated glands (Peyer's patches) become swollen and then (usually after the lapse of nine or ten days) begin to undergo ulceration. Sloughs are formed, and these sloughs become separated, usually during the third week of the illness; after this the ulcer, in the absence of an unfavourable issue, gradually heals. In association with the intestinal mischief the lymphatic glands of the mesentery become enlarged, and the spleen is almost always considerably swollen and congested. The treatment of the malady consists in enforcing absolute rest in bed and administering a suitable diet, from which all forms of solid food must be carefully excluded. In severe cases stimulants are generally necessary, and drugs are sometimes administered with the special object of reducing the fever. Lung complications, hæmorrhage, etc., require, of course, the adoption of special measures. Perhaps in no disease is the patient more dependent upon skilled nursing than in typhoid fever. The disease usually occurs in children and young adults, and is rare at later ages. It is especially prevalent in the autumn, and is least common in spring. Dr. William Budd first directed attention to the fact that cases of the disease were traceable to the consumption of polluted water, and this mode of origin of enteric fever has been abundantly confirmed by subsequent researches. Typhoid fever has also been caused by contaminated milk and cream. In some instances it has been attributed to the effluvia from drains and sewers to which typhoid stools have obtained access. The disease does not appear to be conveyed from person to person, as is the case with scarlet-fever and small-pox, and those who are brought in contact with typhoid fever patients incur little risk of contracting the malady provided they adopt ordinary precautions as to cleanliness. The numerous outbreaks of the disease which have been traced in recent years to the contamination of public water-supplies, and the great reduction of typhoid mortality in the United Kingdom which has followed upon the adoption of improvements designed to prevent faecal contamination of drinking-water, sufficiently indicate the most important source of the disease, and the direction in which the safety of the individual can be further assured. A particular organism to which attention was first directed in 1880 by Eberth, and which has been since attentively studied by Gaffky and others, is almost invariably met with in the spleen, Peyer's glands, and mesenteric glands of typhoid patients, and is usually considered to be the cause of typhoid fever.

Typhus Fever, an infectious malady, the chief symptoms of which are fever and a characteristic eruption, which appears about the fifth day from the beginning of the illness. The period of incubation varies between five or six days and a fortnight. The disease is ushered in with the

ordinary symptoms of fever, the attack being often quite sudden; the temperature is considerably elevated from the first, and attains its maximum at the end of five or six days. It remains high for a few days, and subsides by crisis about the thirteenth or fourteenth day in cases which recover. The rash consists of what is called a subcutaneous mottling and of dusky red spots, and presents some resemblance to the eruption of measles. It is developed usually on the fourth or fifth day, and the severity of the disease bears generally some relation to the abundance of the rash. The nervous symptoms of typhus fever are usually prominent. There is at first headache, then some tendency to delirium, and at the end of the first week the patient is markedly delirious. In fatal cases death is ushered in by coma and sometimes by convulsions. The mortality is about 15 per cent., and is not very different from that of typhoid fever, though it should be noted that the prospect of recovery in typhus is very much less in the case of old than of young patients, a contrast which does not hold good in typhoid. The disease, which is now of rare occurrence in the United Kingdom, was at one time widely prevalent. Epidemics occurred from time to time, particularly in association with overcrowding and distress, such as were met with in the unhealthy areas of towns, in prisons, and in camps. It has been especially fatal in Ireland. In recent years in Great Britain its effects have only been manifested by the occurrence of small groups of cases in large centres of population, particularly in certain seaport towns.

Tyrcounnel, RICHARD TALBOT, EARL OF, an adventurer, was born in Ireland about 1625. He went to London and, after many discreditable Court intrigues, gained the favour of James II., who, on his accession, made him Earl of Tyrcounnel and commander-in-chief in Ireland. In 1687 he became Lord-Lieutenant, and in that capacity did his best to assist the king in his Catholic schemes. In 1689 he raised Ireland for his exiled master, commanded the infantry at the Boyne, and after the first siege of Limerick followed him to France. He returned to Ireland in 1691 and died at Limerick in the same year.

Tyre, an ancient city of Syria, on the Mediterranean, 46 miles S.S.W. of Beirut. Besides this island-city (now connected with the mainland by an isthmus which arose through the accumulation of sand on either side of Alexander's Causeway) there was a large town called Palatyrus, on the neighbouring shore. The island-city is mentioned in an Egyptian papyrus as far back as the 14th century B.C., and the Old Testament abounds in allusions to its commercial activity. It was famous for its purple dyes and glassware and was one of the greatest trading communities of antiquity. In the 6th century B.C. it passed under Persian rule and in 332 B.C. fell before Alexander the Great, after a celebrated siege. It was a stronghold under the Arab empire, but was occupied by the Crusaders from 1124 to 1291. After their departure it fell into the hands of the Moslems, who reduced it to a heap of ruins. Sur, the present town, built since

1766, when the Metawila arrived in the district, has a population estimated at 6,000.

Tyrol, or TIROL, a province of Austria, bounded on the N. by Bavaria, on the E. by Salzburg and Carinthia, on the W. by Switzerland, and on the S. by Italy. It occupies an area of 10,320 square miles, or, including Vorarlberg, the westernmost district of Austria, which is united with it, 11,324 square miles. The surface is mountainous, being traversed from east to west by the main chain of the Alps, and includes the basins of the Inn and the Lech in the north, and the Etsch (Adige) and the Drave in the south. The chief crops are maize, wheat and other cereals, pulse, potatoes, turnips, flax, hemp, tobacco and cabbages, whilst it is famous for its apples and grapes, oranges, lemons, almonds and olives being also cultivated. Dairy-farming and the raising of live-stock are important industries and silk-worms are reared on a large scale. The minerals include iron, copper, silver-lead, zinc, sulphur and salt, but the manufactures are of no great consequence. The country affords excellent sport in the chase of the chamois and deer. The Tyrolese are noted for their loyalty to the House of Hapsburg, of whose hereditary dominions their country has formed a part since the 14th century. The capital is Innsbruck (27,056). The provincial Diet consists of 68 members and the province sends 21 members to the Lower House of the Austrian Reichsrat. Pop. (1900), 850,062, or, including Vorarlberg, 981,949.

Tyrene, a county in the province of Ulster, Ireland, bounded on the N. and W. by Donegal, on the N.E. by Londonderry, on the E. by Lough Neagh and Armagh, and on the S. by Monaghan and Fermanagh. It is 48 miles long, with a mean breadth of 28 miles, and has an area of 1,260 square miles. The surface is mostly hilly, rising to a height of 2,236 feet in Mount Sawell, in the north-east, and sinking into a plain in the neighbourhood of Lough Neagh. The Mourne, a tributary of the Foyle, is the chief stream. Oats, wheat, potatoes, turnips and flax are the principal crops, and the live-stock include sheep, cattle, pigs, goats, horses, mules and asses, while poultry-farming is vigorously pursued. Coal and iron occur, and marble is quarried. Linen and woollen goods, earthenware, whisky, chemicals, candles and soap are manufactured. Omagh (4,789) is the county town. Pop. (1901), 150,567.

Tyrene, HUGH O'NEILL, 2ND EARL OF, called "the arch-rebel," was born in Ireland about 1540. He spent part of his early manhood in London, but returned to Ireland about 1567, when he was supported by the Government as a kind of makeweight against the unruly chieftains of the north. In 1585 he was admitted to the Irish Parliament as Earl of Tyrene in return for his services against the Earl of Desmond in Munster. He soon, however, began to intrigue with Spain, and in 1595, calling himself The O'Neill, headed a rising against the English. In 1598 he defeated their commander, Sir Henry Bagenal, who was his deceased wife's brother, and the whole of Ireland rose. When Essex arrived with an army, however, O'Neill submitted; but in

1601 he joined the Spanish invaders, and was defeated and wounded. On his submission he was reinstated in his earldom in 1603; but under James I. once more intrigued with Spain. In 1607 he fled to Rome, where he died on July 20th, 1616.

Tyrosine, $C_9H_{11}NO_3$, may be prepared synthetically by reactions which prove its constitution. It forms fine silky needles, colourless, tasteless and odourless, insoluble in ether, and almost so in alcohol, but soluble in boiling water. It may be obtained from almost all animal substances by fusion with alkalis, and is found in many of the tissues of the human body, *e.g.*, liver, spleen, pancreas.

Tyrtaeus, Greek elegiac poet, is said to have been an Athenian by birth, but flourished at Sparta about the middle of the 7th century B.C. He was a lyric poet of some talent, but it was the war-songs which inspired the Spartans in their Messenian wars which made his name famous. A few of these have been preserved.

Tyrwhitt, THOMAS, critic and commentator, was born in London on March 27th, 1730, and educated at Eton and Queen's College, Oxford. He was called to the bar in 1755, but was not strong enough to practise. He was Clerk of the House of Commons from 1762 to 1768, withdrawing himself from official life to devote himself to his books. He was one of the most accomplished linguists and philologists of his day, and is still held in high esteem for his scholarly edition of Geoffrey Chaucer's *Canterbury Tales* (1775). His *Observations and Conjectures upon some Passages of Shakespeare*, published anonymously in 1766, proved of value to several editors of the dramatist's works, and his exposure (1777) of poor Chatterton's forgeries was complete. He died in London on August 15th, 1786.

Tytler, a family of Scottish historians. (1) WILLIAM TYTLER (born at Edinburgh on October 12th, 1711; died at Woodhouselee, his place on the Pentlands, on September 12th, 1792), published in 1759 an attempted vindication of Mary Stuart, and edited in 1783 *The Poetical Remains of James I. of Scotland*. (2) ALEXANDER FRASER TYTLER, his eldest son (born at Edinburgh on October 15th, 1747; died at Edinburgh on January 5th, 1813), practised at the Scottish bar, and in 1802 became Lord Woodhouselee and a judge of the Court of Session. In 1780 he was appointed Professor of History at Edinburgh University, and in 1801 published the popular *Elements of General History*. He also wrote a life of Lord Kames. (3) PATRICK FRASER TYTLER (born at Edinburgh in 1791; died at Malvern on December 24th, 1849), fourth son of Lord Woodhouselee, was called to the Scottish bar in 1813. Besides several biographical works he wrote a *History of Scotland* in several volumes (1828-43), *The Progress of Discovery on the more Northern Coasts of America* (1832), and *England under the reign of Edward VI. and Mary* (1839). In recognition of his literary services he received in 1844 a Civil List pension.

U

U, the twenty-first letter of the English alphabet, is said, together with v, w, y, to come from the ancient letter Vau (F). U and V in later times became interchangeable, but V was sometimes retained as an initial letter, and U as a medial. The Anglo-Saxon *u* sound is still partially preserved in such words as *butcher, full*, etc., and particularly in the North Country, as also in German and some of the Romance languages, and in many English words now spelt with *oo*. The French *u* and German *ü* are alike in sound, and the same sound of the letter is to be found in Welsh and in the West of England.

Ucayali, a river of Peru, South America, rising in the Andes as the Apurimac, and flowing northwards for about 1,000 miles, during which course it receives, on the right, the Quillabamba and, on the left, the Mantaro and Pachitea and finally unites with the Marañon, in about 4° 35' S. to form the Amazon. From the Amazon there is regular navigation as far as the confluence of the Pachitea.

Udall, NICHOLAS, dramatist and scholar, was born in Hampshire, England, in 1505, and educated at Winchester and Corpus Christi College, Oxford. He was ordained and from 1534 to 1541 was headmaster of Eton and about 1554 was appointed to a similar post at Westminster. In the interval he was largely engaged in translating Erasmus's *Paraphrase of the New Testament* and in conducting, on the Reformed side, several controversies with Catholic disputants. He died at Westminster in December, 1556. His chief claim to renown is that he wrote about 1541, possibly for performance at Eton, *Ralph Roister Doister*, the earliest of English comedies. It is in rhyme, and only one printed copy of the original edition is known, but there are modern reprints.

Uganda, a British Protectorate in Central East Africa, bounded on the N. by the 5th degree of northern latitude, on the E. by a line drawn down the middle of Lake Rudolf and along the northern and western boundaries of the East Africa Protectorate, on the S. by German East Africa and the 1st degree of southern latitude and on the W. by the Congo Free State. Its area is estimated at about 223,500 square miles. It thus includes the northern half of Victoria Nyanza, part of Lake Albert Edward, nearly all Lake Albert, all Lake Kioga, the western half of Lake Rudolf, and the Nile from its emergence from Lake Victoria to Lado. The soil is very fertile and the products include coffee, cotton, arrowroot, rubber, fibres and chillies. Iron is plentiful and copper and gold occur. The British administrative headquarters are at Entebbe, while the native capital is at Mengo. The Uganda railway extends from Mombasa on the coast to Kisumu on Victoria Nyanza. In 1877, under the auspices of King M'Tesa, Anglican and Catholic missionaries settled in the country, but on his death in 1884, M'Wanga, his successor, influenced by Arab slave-dealers, began persecutions. The king was deposed by his brother, Kawewa, but ulti-

mately returned and embraced Romanism. Meanwhile, in 1888 the Imperial British East Africa Company had acquired from the Sultan of Zanzibar and other chiefs nearly all the district between Uganda and the East Coast. The civil war raging beyond their border led to the interference of the Company's officials, and by a treaty with Germany in 1890 the country was brought within the sphere of British influence, Sir Gerald Portal acting as Imperial Commissioner. In 1894 a British Protectorate was proclaimed over the territory of Uganda, and in 1896 this was extended over Unyoro and Usoga. The province has the status of a native kingdom under a Kabaka, who bears the title of His Highness. Pop. (estimated), about 4,000,000, of whom some 400 are Europeans.

Ugolino, COUNT, immortalised by Dante in his *Inferno*, was born in the 13th century of an illustrious family, named Gherardesca. He was appointed chief magistrate of Pisa, and attempted to form a principality, as Visconti had done at Milan, and Della Scala at Verona. In 1274 he was imprisoned by the Pisan Government for his intrigues, but was recalled in order to assist in defending Pisa, then harassed by enemies. By treachery and bribery he managed to secure the control of the government, and ruled his subjects ruthlessly. Roger de Ubaldini, Archbishop of Pisa, with whom he had made a pact, which he failed to keep, conspired against him, and being as unscrupulous as himself, caused his arrest in 1288, and had him starved to death in March of the following year.

Uhland, JOHANN LUDWIG, poet, was born at Tübingen, Wurtemberg, Germany, on April 26th, 1787, and in 1810 went to Paris to study law, but gave most of his time to the examination of old German manuscripts. He settled in Stuttgart as a lawyer on his return, and published his first volume of poems in 1815. These *Gedichte* have been widely admired for their grace and charm, not untouched with a feeling for the romantic and chivalrous. In 1829 he became Professor of the German Language and Literature at Tübingen University. This post he resigned in 1834 to pursue a political career and in 1848 he was elected to the Frankfort Parliament. He died at Tübingen on November 13th, 1862. He published various dramas, critical essays, etc., but his *Gedichte*, which were frequently revised and added to, have made his name a household word throughout the German states.

Uigurs, a historical Turki people, who towards the close of the 10th century rose to great power under their Khan, Satuk Boghra. Bishbalik, the present Urumsai, was the chief seat of their empire, which stretched from the frontiers of China to the Caspian Sea. Before the introduction of Islam under Satuk Boghra the Uigurs had been converted in large numbers to Christianity by missionaries from Syria, who first arrived in the 7th century, and reduced the Uiguric language to written form with an alphabet based on the Syriac. This script was afterwards adopted by the Mongolians and Manchus, amongst whom it is still in use. The Uigurs, who are the Hœi-Hœi and Kas-che of the

Chinese records, are extinct as a separate nationality; but, having taken part in the first Mongol invasion of Europe, their name still survives in the "ogres" of fable and the nursery. The Chentu people of the Turfan district, south-east of Urumsai, claim to be descendants of the Uigurs, and in 1890 the Russian explorer, Grun-Grijimailo, discovered in their territory many remains of the former Uigur culture.

Uist, two islands of the Outer Hebrides, Inverness-shire, Scotland. NORTH UIST lies 2½ miles N. of Benbecula, which divides it from South Uist, and 100 miles N.W. of Oban. It is of irregular shape, measuring 18 miles from east to west, and from 3 to 13 miles from north to south, with an area of 118 square miles. In the east its surface is marshy and barren, broken by countless lakes, but to the west it rises to the height of Ben Crochan, 1,500 feet, and here occur several valleys, where oats, barley and potatoes are grown. Fishing and sheep-breeding, with the gathering of sea-weed, are the chief industries. Pop. (1901), 2,936. SOUTH UIST lies 1 mile S. of Benbecula, is 22 miles long with a greatest breadth of 8 miles, and resembles North Uist in most respects, except that its highest point, Mount Hecla, attains an altitude of 1,988 feet. The area of the island is 127 square miles. Pop. (1901), 3,541.

Ukraine (Polish, "Frontier"), the name formerly given to a province extending over part of Russia and South-Eastern Poland, and now divided into the governments of Kiev, Poltava, Tchernigov, Podolia and Kharkov. Ceded by Poland to the Cossacks in 1672, and acquired by Russia in 1682, it was subsequently shared between Russia and Poland, the Dnieper separating the two countries. In 1795 Russia annexed the whole.

Ulcer, a sore resulting from the destruction of a portion of the skin, or of the mucous membrane, as the result of injury, inflammation, or new growth. While an ulcer thus affects the cutaneous or mucous surfaces, the mischief may originate in deeper parts, and spread outwards, so as to involve the overlying skin or mucous membrane. There are certain predisposing causes of ulceration which demand consideration; any impairment of general nutrition, such as is present in scurvy, gout, etc., may exert such an influence, and interferences with the activity of the general circulation, or local obstructions to the flow of blood through the affected part, have considerable effect in this connection. Several varieties of ulcers are described, among which may be mentioned the healing ulcer, the chronic ulcer, the sloughing ulcer, the syphilitic ulcer, the strumous ulcer, the scorbutic ulcer, the rodent ulcer, and the epitheliomatous ulcer. The treatment of ulcers is essentially bound up with their cause, and must necessarily be carried out under skilled advice.

Ulema (Arabic, "The Learned"), a class of theologians and expounders of Mohammedan law, to be found in most great Mohammedan cities of the East, notably at Constantinople, Mecca and Cairo. So far as Turkey is concerned, the Sheik-

ul-Islam is at their head, and they are divided into (1) mollahs, (2) muftis, (3) imaums, (4) softas, or students. Their decrees are called "fetvas," and they have great influence upon Mohammedan life, chiefly of a conservative nature.

Ullswater, next to Windermere the largest of the English lakes. It is situated between the counties of Cumberland and Westmoreland, 5 miles



ULLSWATER.

(Photo : Green Bros., (Grosmere).)

S.W. of Penrith. Its length is eight miles, and its average breadth one mile, the depth being about 210 feet. It is of somewhat sinuous shape, with a general trend from south-west to north-east, and comprises three reaches of which the northerly beginning at Pooley Bridge is the quietest, the middle including Gowbarrow Park the most romantic, and the third, or southerly, ending at Patterdale the grandest, overlooked as it is by the magnificent mass of Helvellyn (3,118 feet high).

Ulm, a city of Würtemberg, Germany, on the left bank of the Danube, 46 miles S.E. of Stuttgart. The river being navigable from this point, Ulm has long been a place of commercial and military importance, and was one of the Imperial free cities. The cathedral is the finest specimen of 14th-century Gothic in Germany after the famous Dom of Cologne. The manufactures include cotton, woollens, paper, leather, beer, pipe-bowls and Ulmer bread (a species of pastry). Here in 1805 General Mack surrendered to the French under Marshal Ney. Pop. (1905), 51,680.

Ulphilas, the apostle of Christianity to the Goths, is believed to have been born in 311. He became a Greek Christian after being sent to Constantinople about 332, probably as a hostage, and seems to have taken some kind of orders. He studied the Scriptures deeply and was in 341 made Bishop of the Goths by Eusebius of Nicomedia. He laboured with great success among the people and was accordingly so bitterly persecuted by pagan chiefs that he led large numbers of his flock to the south of the Danube and settled for a period near

the modern Tirnova (348). For his people he translated the Scriptures into Gothic, in virtue of which achievement he may be regarded as the father of Teutonic literature. Although only a small portion of his translation has been preserved, it is of remarkable philological value. He died at Constantinople in January, 381.

Ulster, the most northerly province of Ireland, embraces the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan and Tyrone, having an area of 8,613 square miles. Settled by the English in 1611, and largely colonised by Scots, it is the most commercially prosperous and the most distinctively Protestant quarter of the island, though the Catholics largely preponderate. Ulster tenant right, by which outgoing occupiers receive compensation from their successors, was the basis for legislation in the Irish Land Act of 1870. Agriculture, flax-spinning and shipbuilding are the leading industries. Pop. (1901), 1,582,826.

Ultramarine. The well-known pigment of this name was formerly entirely obtained from the naturally-occurring mineral lapis-lazuli, and was then much prized and very costly. The observation, however, of blue masses in the furnaces used for the preparation of soda led to an artificial preparation of the compound, which was first effected in 1828 by Christian Gottlob Gmelin (1792-1860), Professor of Chemistry at Tübingen. It is now manufactured by heating a mixture of clay, glauber salt, white sand, sulphur and resin, in crucibles placed in suitably-arranged furnaces. The exact constitution of ultramarine is unknown, and analyses of different samples vary. They all contain, as essential constituents, silica, alumina, soda and sulphur, and may perhaps be regarded as a variable thiosilicate of alumina and soda. The varieties are usually more stable the more silica there is present. The pigment is very largely employed for the manufacture of water- and oil-colours, for paper-staining, and also in calico-printing.

Ultramontane, a term used in contradistinction to Gallican, to signify the doctrine that Papal utterances *ex cathedra* on matters of faith and morals are irreformable and therefore final and conclusive. The Ultramontane party are thus the Extremists in the Catholic Church, placing the Pontiff supreme and above everything. The term literally means "beyond the mountains" (the Alps). In France the reference would be to Catholics south of the Alps; in Italy to Catholics north of the Alps.

Ulugh-Beg (1394-1449), a Tatar prince and astronomer, was the grandson of Tamerlane, and his real name was MOHAMMED TARAGAI. Devoted to scientific pursuits, he acquired great knowledge of astronomy and geography, and founded institutions to spread such knowledge. He assisted his father in the government of Samarcand and succeeded him in the principality in 1447, but was put to death two years later by his son, who had revolted. He wrote some valuable observations on

the fixed stars, and also works on geography and chronology.

Ulverston (locally pronounced "Ooston"), a town of Lancashire, England, 17 miles N.W. of Lancaster, near the mouth of the Leven, which discharges into the north-western arm of Morecambe Bay. The church of St. Mary was founded in 1111 and rebuilt, mostly in the Perpendicular style, in the time of Henry VIII. Of the original building, however, there still remains the southern door, a good example of the Transition. The chief industries are iron-founding (with large ironworks), brewing, milling, tanning and the making of revolving shutters. The former manufactures of linens, checks and ginghams are now comparatively limited. The vicinity is rich in iron and copper ores, limestone and blue and green slate. Pop. (1901), 10,064.

Ulysses (the Latin form of the Greek ODYSSEUS) was the name of a Greek hero, king of the Isle of Ithaca, who fought with great prowess at the siege of Troy. His adventures after leaving Troy are related in Homer's immortal *Odyssey*. The lotus-eating of the Lotophagi, the killing of Polyphemus, the enchantment by Circe, the wreck off the isle of Ogygia, and the final return to his faithful wife Penelope, are all described by the bard.

Umbel, a kind of inflorescence in which the pedicels all proceed from a single point, and are of equal length, or corymbose.

Umbelliferae, a natural order of calycifloral dicotyledons, comprising about 1,500 species in nearly 300 genera, for the most part northern and extra-tropical. They are mostly herbaceous, though in many cases perennial, and sometimes of considerable size. The stems are usually fistular, and the leaves scattered, exstipulate, pinnately compound or decomposed, and furnished with a well-developed sheath. The inflorescence is generally a compound umbel of small flowers, most commonly white and protandrous. The calyx consists of five superior sepals; the corolla, of five epigynous petals with inflexed points: there are five stamens and two coherent carpels with separate styles, and an epigynous disc. Each carpel contains one pendulous anatropous ovule, which forms an albuminous seed. The fruit is a cremocarp, generally dehiscing into two mericarps, which are often, as in the case of the caraway, mistaken for seeds. They remain suspended to a carpophore, often Y-shaped, and are marked externally with five or nine ribs, between which lie large vittæ, or sacs, containing essential oil. Many of the plants of the order are esculent, their volatile oils giving agreeable flavours to the roots of angelica, carrot and parsnip, the foliage of parsley and fennel, and the carminative fruits of celery, caraway, anise and coriander. Others contain fetid gum-resins, and others acrid poisonous sap, such as the hemlocks. There are about fifty-five British species in no fewer than thirty-five genera.

Umbel, a pigment which consists of a clay coloured by oxides of iron and manganese. The

raw material is "burnt," by which means water is expelled and the pigment takes a redder colour. It is then powdered and may be used for the preparation of either water-colours or oil-colours. The best varieties are obtained chiefly from Cyprus and in consequence of their colour and permanence are valuable pigments.

Umbilical Cord, the structure which serves to convey the blood circulating in the system of the foetus to and from the maternal placenta. It contains two arteries, which carry venous blood to the placenta, and a single vein, which conveys blood from that organ to the foetus.

Umbrella, originally a sun-shade, but in northern climates transformed into a protection against rain. It was a symbol of royalty and authority, and as such was used in Egypt, Nineveh, Persopolis, etc., and is so employed by South African potentates of the present day. It was used by women in Greece and Rome; and in Spain, France, and perhaps England, was so used by women in the 16th century; but the first man to use it in England as a protection against rain is said to have been Jonas Hanway (1712-86), the traveller and philanthropist, about the middle of the 18th century.

Umbria, a province of ancient Italy, situated between Cispadane Gaul on the N. and the Sabine territory on the S. It derived its name from the Celtic tribe, Umbri, who became subject to Rome, after a severe struggle, in 280 B.C. Their country, though divided in later times between Spoleto and Urbino, retained its geographical designation. It is drained by the Tiber and Velino, contains Lake Trasimeno, and is rich in agricultural produce. The modern compartimento of Umbria, which embraces the single province of Perugia and has an area of 3,748 square miles and a population (1901) of 644,367, corresponds to some extent with the ancient Umbria. It formed part of the Pope's dominions till 1860, when it was incorporated in the kingdom of Italy.

Unconformability, an interruption of the sequence of stratified rocks, in consequence of which the various parts of the undersurface of an overlying stratum do not rest upon corresponding parts of the underlying stratum. In cases of extreme or marked unconformability it is accompanied by a change in dip, as where, in various parts of England, horizontal Triassic rocks rest upon curved Carboniferous ones. This generally implies a considerable break in time, during which the lower strata have been tilted or folded, planed down by denudation, and redepressed, so as to be covered by the more modern deposits. In other cases, however, there may be no discordance in dip, as where horizontal Thanet Sands rest upon the eroded surface of equally horizontal Chalk. This may mark a lesser break in time.

Undine, a species of female water-sprite, possessing a human body, and capable upon marriage with man of receiving a soul. La Motte Fouqué (1777-1843), in his exquisite story *Undine*, gives us an example of such a wayward spirit, who was brought up by a fisherman and his wife, and

who greatly perplexed them by her vagaries till her marriage with a wandering knight humanised her. Her husband eventually lost her through his unfaithfulness and she returned to her native element.

Undulatory Theory. Sir Isaac Newton accounted for the effect of light by supposing that any source of light threw off tiny material particles in every direction, and that these, hitting against the retina, produced the sensation of light, *i.e.*, caused us to see the luminous body. This hypothesis was known as the Corpuscular Theory, and held ground for some time; but it was shown that a result of this theory would be that light would travel faster in very refractive substances than in less refractive ones; it would, for example, have a greater velocity in water than in air. Now experiment proves this to be untrue; light travels faster in air than in water and other highly refractive substances. So that theory broke down, and the Undulatory Theory has been accepted in its stead, it having been found to lead to conclusions consistent with actual experiment. According to this theory, a certain highly elastic medium is supposed to exist everywhere in space. The densest solid is permeated with it, as well as the rarest gas or the farthest realms of airless space. This medium is known as the luminiferous ether, agitation throws it into a state of vibration, and the vibration may be propagated in waves of different lengths, travelling with different velocities. Any luminous body is continually sending out these ethereal waves in every direction; those that enter the eye disturb the ether there, and produce an effect on the retina which causes us to see. If on its way a wave meets with a plate of glass, the ether in the glass itself takes up the vibrations and hands them on to the other side; this is the case with all transparent substances. Opaque substances are unable to pass the ethereal waves on, and hence the light is stopped. The eye, however, is not affected by all the vibrations capable of being transmitted by the ether; only those of certain wave-length cause any sensation to be carried by the optic nerve. The waves which we call light-waves are extremely short, varying from .00003933 to .00007604 centimetres, according to their colour, those of blue being shorter than those of red light. Shorter waves still rush through the ether and produce definite effects, though the eye cannot detect them. Phosphorescent substances can grasp them, and photography eagerly picks them out. Longer waves we feel as heat, and the waves of electric disturbance may be many miles in length. James Clerk Maxwell (1831-79), Professor of Experimental Physics in Cambridge University, supposed that all these ethereal waves were the effect of electro-magnetic disturbance, and his theory, though incomplete at the time of his death, was afterwards gradually elaborated and found to explain in the most satisfactory way many of the observed phenomena in optical science. [RADIATION.]

Ungulata, or **HOOFED QUADRUPEDS**, an order of Mammals, with two sub-orders, Artiodactyla—those having an even number of toes, as the pig,

hippopotamus, sheep, ox, deer and camel—and Perissodactyla—those having an odd number of toes, as the horse, tapir and rhinoceros. The Hyracoidea, or Conies, and Proboscidea, or Elephants, are now generally included.

Uniformity Act, THE. An Act for securing uniformity of ceremonies, doctrines, and formularies in the Established Church of England, was passed in 1662. An Act had already passed in this direction in the reign of Edward VI. (1549), been repealed by Mary (1554) and re-enacted by Elizabeth in 1559. One immediate effect of the Act of Charles II. was to drive many clergymen out of the Church, and hence the date of its enforcement (August 24th) was, somewhat hysterically, called Black Bartholomew Day. An Amendment Act was passed in 1872.

Union, the tie that binds Scotland and Ireland politically to England. The Crown of Scotland became united to that of England on the accession of James VI. of Scotland to the English throne on March 24th, 1603; but the Parliament of Scotland did not cease till 1707, in which year (May 1st) it was decided that one Parliament should administer the affairs of the two nations, and that the same custom laws, weights and measures, etc., should prevail in both countries. Scotland received the right of sending 16 representative peers to the British House of Lords and 45 members (increased by the later Reform Acts) to the House of Commons; it was allowed to retain its Established Presbyterian Church, and its own law courts, judges and system of law. Ireland, which from the time of Henry VIII. was looked on as part of the kingdom, lost its Parliament in 1800. The Act of Union, which came into force on January 1st, 1801, gave her four spiritual and 28 temporal peers and 100 members in the House of Commons.

Union Jack. [FLAG.]

Unitarians, or believers in One God, is a term that in its widest sense would cover Jews, Mohammedans and many sects of the Christian Church; but it is generally restricted to those of modern times in the United Kingdom and her colonies, including the United States, who deny the divinity of Christ, or at any rate His equality with the Father. The body of Unitarians, as we now know it, dates from 1730, its great preacher having been Thomas Emlyn (born at Stamford, Lincolnshire, on May 27th, 1663; died in London, on July 30th, 1741). The doctrines of Unitarianism are by no means new; the Sabellians and Arians of the early Church held similar doctrines, and the Athanasian Creed was compiled to counteract the views of the Arians. Similar views have also prevailed at different times in parts of the Anglican Church, and the holders of them have been persecuted. The English Unitarians have sometimes been held to have been the representatives of the Presbyterians driven out by the Act of Uniformity in 1662. They had troublous times till the passing of the Toleration Act in 1689, but have since that time been left very much to their own devices. Some hold that Christ was a good man who suffered for truth's

sake, while others place Him in a sort of quasi-divine position. Some are advocates of adult, others of infant baptism. Their system is congregational, so there is no formulated general creed. Where they observe the Lord's Supper it is as a commemorative act, and not as a sacrament. Among writers who have had influence among them may be mentioned Priestley, Channing, Emerson and Martineau.

United Free Church of Scotland, constituted in 1900 by the union of the Free and United Presbyterian Churches. The Rev. Dr. Robert Rainy, who had borne a prominent part in bringing about the amalgamation, was elected the first Moderator. A small minority, which became popularly designated the Wee Frees, maintaining that the union was *ultra vires*, ultimately appealed to the House of Lords, which upheld their contention. The decision created such widespread discontent that Government in 1905 appointed a Commission of inquiry into the whole question. In the following year sanction was given to their Report (issued in October), according to which the colleges in Edinburgh, Glasgow and Aberdeen; the Assembly Hall; the bulk of the funds and property of the Foreign Mission Scheme, and the churches in which the congregations were predominantly in favour of the union were awarded to the United Free, while the Library was to be managed by a Joint Committee. The former United Presbyterians, of course, had not been affected by the litigation and were therefore not directly concerned in the settlement.

United Kingdom, a term comprehensively describing England and Wales, Scotland, Ireland, the Isle of Man and the Channel Islands. The following table gives the areas and populations of these component parts :—

DIVISION.	AREA IN SQUARE MILES	POPULATION.
England and Wales	58,324	32,527,843
Scotland	30,405	4,472,103
Ireland	32,300	4,458,775
Isle of Man	227	54,752
Channel Islands	75	95,618
TOTAL	121,331	41,609,091

To the total of the population must be added 367,736 representing the army, navy and merchant seamen abroad, making a grand aggregate of 41,976,827.

United Presbyterians, a former division of the Presbyterian Church of Scotland, having its origin in the union (1847) of the Secession Church, formed in 1733 under the auspices of Ebenezer Erskine (1680-1754), with the Relief Church, formed in 1752 as a protest against patronage and to vindicate the right of election of incumbents. Various attempts have been made to reconcile the United Presbyterians to the mother Church and in 1900 they became amalgamated with the Free Church under the style of the United Free Church of Scotland.

United States of America. [AMERICA, NORTH.]

Units are the standards of reference in terms of which we measure any concrete quantity. Thus we may measure a length in feet or metres, in which case the foot or the metre is the unit of length. That such standards should be absolutely fixed is obviously necessary. Although in olden days many pounds were in use, and each pound had its name, e.g., the Tower pound, merchant's pound, etc., and indicated a definite mass, nevertheless it is extremely probable that the existence of many different standards made it more difficult for the ignorant to avoid being the victims of commercial deception. In modern times the tendency has been to reduce the number of units as far as possible—to have, in fact, only one unit for each kind of quantity. Custom in the United Kingdom, however, is far from perfect in this respect, as is testified by the existence of the pounds troy and avoirdupois as units of mass, while area on a small scale is given in square feet at the same time that a field is measured in acres. A gallon and a cubic foot are both units of volume, but memory must play its part in connecting one with the other, as well as in the reduction of acres to square feet. This kind of multiplicity of units arises from the fact that in Great Britain and Ireland the whole system is perfectly arbitrary and wholly unscientific. There is no connection between the common units of volume or area and that of length. A scientific system, on the other hand, chooses its unit of area to be the square of its unit of length, and its unit of volume to be the cube of the same. This simple state of things exists in the centimetre, gramme, second, or C.G.S. system, and it is therefore adopted in scientific work all over the world. In it the centimetre (equal to $\frac{1}{2.54}$ of an inch) is the unit of length, the square centimetre that of area, while volume is estimated in cubic centimetres. The unit of mass is the gramme, that being the mass of a cubic centimetre of pure water at the temperature at which it has its maximum density (4°C.); and the unit of time is the second. Again, instead of having to execute a series of mental gymnastics, such as are required in transforming a certain number of, say, ounces into tons or inches into furlongs, all such changes are made by means of a multiplication or division by powers of ten. The so-called "dry measure" has no analogy in a scientific system, so that one is spared the inconvenience of endeavouring to realise what is meant by, say, a chaldron of coke, even if one does succeed in reducing it to bushels, since such a substance can only be reasonably estimated by weight. A unit, such as that of length or volume, which is defined by reference to another unit—in this case, that of length—is termed a derived unit.

Universalists are the members of a school of theology or philosophy which holds, with different modifications, the doctrine that all mankind will reach a final state of happiness hereafter, with perhaps a passage, in this world or elsewhere, through a period of expiatory probation. The doctrine, which has had a considerable develop-

ment in the United States, owed much of its impulse to the Rev. John Murray (1741-1815), who went to New Jersey in 1774, and became the disciple of James Rely, who was an advocate of its tenets. Hosea Ballou (1771-1852) also did much to spread it in the first part of the 19th century. The Pelagians of old held the doctrine, as do also many Unitarians.

Universal Language. There is Scriptural warrant for the statement that, till the building of the tower of Babel (an event conjecturally fixed at 2247 B.C.), "the whole earth was of one language and of one speech" (Genesis xi. 1). Doubtless the arrogance of the builders was properly punished by the confusion of tongues which prevented them from understanding one another's speech, but the inconvenience to mankind has been incalculable. From time to time attempts have been made to establish artificially a universal language in order to facilitate commercial dealings and generally to promote intercommunication between nations. It cannot be said, however, that pronounced success has attended any of these noble aspirations. Volapük (a word coined out of *vol* for "world" and *pük* for "speak") was invented in 1879 by a Swabian pastor named Johann Martin Schleyer. It was largely based on English, and grammars, dictionaries and newspapers were printed in the new language, but it never made much headway. At a later date it was followed by Esperanto (q.v.), the invention of Dr. Zamenhof of Warsaw, which achieved for a while a *succès d'estime*. Though the use of a common language is a consummation devoutly to be wished for, its introduction seems to lie in the dim and distant future, and in any case must come about naturally. Probably the problem will solve itself, so far as one can tell, by the gradual dissemination of the English tongue throughout the globe.

Unterwalden, one of the Forest Cantons of Switzerland, divided into Obwalden, or Upper (183 square miles), and Nidwalden, or Lower (112 square miles). The surface is mountainous, the highest points being the boundary masses of Titlis (16,627 feet) and Pilatus (6,995), while the Aa is the chief stream. Dairy-farming, fruit-rearing and the raising of live-stock are the principal occupations. Sarnen (3,974) is the capital of Obwalden and Stans, or Stanz (2,762), of Nidwalden. Pop. of Obwalden (1905), 15,343, of Nidwalden, 13,272, or of the whole canton, 28,615.

Upas Tree, the native name of *Antiaris toxicaria*, a very poisonous artocarpaceous tree of Java, about which many fabulous stories were circulated during the 18th century. It grows sometimes in the dormant volcanic craters of the island, where the exhalation of the heavy and suffocating carbon dioxide kills insects, fishes, birds, tigers and even man—effects attributed to the tree. Its milky latex, however, is caustic, acrid, and poisonous, being known as antiar to the Javanese. It dries, on incisions made in the bark, into the gum-resin known as upas, with which the natives poison their arrows and cris.

Uppingham. [THRING.]

Upsala, the former capital of Sweden, on the Fyris, a small stream flowing to Lake Mälär, 40 miles N. by W. of Stockholm. It is one of the most ancient cities of Scandinavia. The cathedral, in which the kings were crowned, dates from 1258, and the university was founded in 1477. There is also an ecclesiastical college; and the Archbishop of Upsala is Primate of Sweden. Excepting the manufacture of silk fabrics and tobacco in small quantities and some trade, the industries are insignificant. It is the chief town of the län or government of the same name, which has an area of 2,051 square miles, contains important iron-mines and has a population (1905) of 125,610. Pop. of Upsala city (1905), 24,339.

Urachus, a fibrous cord connecting the summit of the bladder with the anterior abdominal wall.

Uræmia, the condition in which, owing to defective excretory action on the part of the kidneys, certain products are retained within the system, and circulate in the blood. The chief phenomena produced by such retention are cardiac hypertrophy, thickening of the smaller arterioles, dropsy, and certain congestions and inflammations. But the characteristic symptoms commonly spoken of as uræmic symptoms are more particularly the nausea, vomiting, diarrhoea, hurried respiration, drowsiness, coma, and convulsions, which sometimes occur. When the more serious of these symptoms are present, the patient is said to suffer from a uræmic fit. [BRIGHT'S DISEASE.]

Ural or Oural Mountains, THE, a range extending from the Arctic Ocean to the north of the Aral Sea, and separating European from Asiatic Russia. It has a length of about 1,400 miles and a breadth at most of 60 miles, the average elevation being 3,000 feet, though some points rise to 5,500 feet. Composed mainly of crystalline schists and igneous rocks, the Urals are exceedingly rich in precious metals, e.g., gold, platinum, iridium, green carbonate of copper. Diamonds are also found. The Petchora, Kama, Ufa and other rivers rise here, the chief, however, being the Ural, which flows for nearly 1,400 miles into the Caspian Sea. Orenburg is on its banks.

Ural-Altaic Languages, a linguistic family of the agglutinating order of speech, current throughout the domain of the Ural-Altaic race, and also spoken in Hungary. Excluding the Korean and Japanese, as well as the extinct Accad of Babylonia and the Etruscan of Etruria, whose relations to the Ural-Altaic group are still a moot question with philologists, there are five clearly-recognised branches, with numerous subdivisions, as under:—(1) *Ugro-Finnic*, including Finnish, Lapp, Esthonian, Mordvinian, Permian, Ostiak, Vogul and Magyar; (2) *Samojedic*, including Yurak, Tagvi and Kamasin; (3) *Turkic*, including Uigur, Chagatai, Kipchak, Osmanli, Chuvash, Yakut and Siberian Tatar; (4) *Mongolic*, including Sharra, Kalmuk and Buriat; (5) *Tungusic*, including Tungus proper, Manchus and Lamut. These branches must have ramified from a common centre—probably the Altai uplands—at an extremely

remote epoch, for the divergence between them is far greater than that between the several branches, not only of the Semitic, but even of the Aryan family. Thus, the difference between Magyar and Lamut, for instance, is greater than that between Italic and Hellenic, or even Indic. Nevertheless, the relationship is thoroughly established, and is based not only on the identity of a considerable percentage of primitive words, but also on certain phonetic and structural resemblances pervading all the branches. Of these resemblances the most characteristic is the arrangement of the formative elements, which are always postfixed—that is, tacked on somewhat loosely to the root, which remains unchanged, while the vowels of the postfixes are modified to harmonise with that of the root, in accordance with the so-called principle of vocalic harmony. Thus, in Turki: *rûh*, "spirit"; *rûh-ân*, "of the spirit"; *rûh-lar*, "spirits"; *rûh-lar-an*, "of the spirits"; but *dil*, "tongue"; *dil-in*, "of the tongue"; *dil-ler*, "tongues"; *dil-ler-in*, "of the tongues," where the strong *u* of root *rûh* determines the strong *u* and *a* of the postfixes *an*, *lar*, which similarly become *in*, *ler*, after the weak *i* of root *dil*. The true agglutinating character of these particles is also shown by the intrusion of plural *lar*, *ler*, and consequent shifting of *an*, *in*. Such a process is absolutely impossible in the inflecting order of speech, where the formative elements are more thoroughly fused with, and consequently inseparable from, the root, as in the Latin *anima*, *animus*, *animas*, etc. Another remarkable feature of the Ural-Altaic languages is the extraordinary development of verbal or quasi-verbal forms—actives, passives, negatives, interrogatives, dubitatives, causatives, reciprocatives and many others—all built up by the same syntactical process, and yielding almost endless possible combinations, nearly 30,000 in the Turki conjugation, and far more in Mordvinian and some other members of the Finnish group. Thus, in Turki: *bil-mek*, "to know"; *bil-me-mek*, "not to know"; *bil-mi-mek* and *bil-mi-me-mek*, "to know" and "not to know," put interrogatively; *bil-il-mek*, "to be known"; *bil-der-mek*, "to make known"; *bil-der-il-mek*, "to be made known"; *bil-der-me-mek*, "not to make known"; *bil-der-il-me-mek*, "not to be made known," etc. etc., each of these being inflected through its several persons, numbers, tenses, moods, participial and gerundial forms. This agglutinating system may be said to run riot in some of the groups, becoming so cumbrous through the heaping-up of particles according to rigid law that it tends to break down under its own weight. It is at this stage of threatening disintegration that symptoms are observed of a gradual transition from agglutination to true inflection, as in Finnish, and especially in the Siberian Ostyak, where in certain positions the root-vowel itself becomes modified—that is, acquires grammatical force independently of the postfixes. Syncope is also at work, as seen in the Turki *bol-up-irdi*, which in Yarkandi (Kashgaria) is shortened to *bolupti*, and in Constantinople to *nopti*—"it had become." All this interferes greatly with the delicate laws of vowel harmony, which once disturbed are never revived,

but gradually give place to more convenient inflecting processes, as developed especially in the Aryan system.

Ural-Altaic Race (MONGOLO-TATARS), one of the main branches of the Mongolic or Yellow division of mankind. Although purely geographical and defective, the Ural and Altai ranges being very far from covering the whole area, the expression Ural-Altaic is to be preferred to Mongolo-Tatar, which is both defective and inaccurate, in fact tautological, Mongol and Tatar being, strictly speaking, synonymous ethnical terms. [TATAR.] There are four well-marked groups—The Tungus and Manchus of North-East Asia as far west as the Yenisei and south to the Amur basin; the Mongols of Central Asia (Mongolia, Baikal, parts of Tibet), with an outlying group in European Russia (Lower Volga); the Turks, improperly called Tatars, of Western Asia, the Balkan Peninsula, Caucasasia and parts of European Russia; the Finns (with the Lapps and Samoyedes) of North-East Europe and North Siberia as far east as the Yenisei. Excluding the Koreans and Japanese, doubtful members of the family, and the Bulgarians and Magyars of Hungary, originally Finno-Turks, but now assimilated to the Caucasian type, these various branches of the Ural-Altaic race occupy an area of not less than 10,000,000 square miles, with a total population of about 50,000,000, of whom 30,000,000 are Turks, 13,000,000 Finns, 5,000,000 Mongols, and 2,000,000 Tungus and Manchus. Owing to secular interminglings with the peoples of the west (Iranians and Europeans of Aryan speech), the western groups present almost every shade of transition between the Mongolic and Caucasian types; but the fundamental unity of the race is established both by their common Ural-Altaic speech and by a few salient physical traits, such as a yellowish complexion, black lank hair, small slant eyes, somewhat flat features, brachycephalic (round) head, short stature, generally below the European average. Amongst many of the Finnish and Turkish groups these traits have been almost obliterated by miscegenation, so that it is extremely difficult to draw the line between Mongol and Caucasian about the ethnical borderlands. For details, see FINNS, MONGOLS, TURKI.

Uralite, a peculiar variety of hornblende, resulting from the alteration of augite crystals. The apparent form of the crystal is thus identical with that of augite, but the mass really consists, not of this substance, but of a great number of minute hornblende crystals. It derives its name from the localities where it was first found, though it has since been seen to be tolerably widely distributed in igneous rocks.

Uranite, a rather rare mineral which occurs chiefly in Cornwall, Saxony, Bohemia and Belgium. It crystallises in the Tetragonal system, and forms lustrous, emerald-green, semi-transparent crystals, rather soft, and possessing a specific gravity of 3.5. It consists chemically of the phosphate of copper and uranium, a lime uranite also occurring, in which the copper is largely or wholly replaced by calcium.

Uranium (chemical symbol, U; atomic weight, 240) is a metal which does not occur to a great extent in the crust of the earth, and of which the chief ore is pitchblende. Its existence in this source was first shown by Martin Heinrich Klaproth (1743-1817) in 1789, but the pure metal was not prepared until over half a century later. Pitchblende consists chiefly of oxides of uranium, which may be present to the extent of 90 per cent., and is found in many localities, notably Cornwall. Combined with other rarer metals, uranium also occurs in the minerals samarskite and cuxenite. As obtained from its salts by reduction with sodium, it is a white metal, malleable and hard, which does not oxidise and tarnish in air, and which possesses the high specific gravity of 18.33. It forms a large number of oxides, of which the trioxide (UO_3) acts as an acid forming salts, the uranates, which somewhat resemble the chromates. It forms also three chlorides by direct union of the elements. Of these the pentachloride (UCl_5) is interesting as existing in two varieties, both very hygroscopic, and decomposed by water. The metal also forms a number of oxysalts, the uranyl salts, which are usually yellow soluble compounds. The nitrate is also called uranium nitrate ($\text{UO}_2 \cdot \text{N}_2\text{O}_5 + 6\text{H}_2\text{O}$), and is used in photography as an intensifier, while printing processes dependent upon the use of the same salt may be employed.

Uranoliths, or HEAVEN-STONES, are the pieces which fall to the earth from a meteor during the passage of the latter through the sky. They are more commonly called meteorites or meteoric stones, the name *aérolites* (air-stones) being also occasionally given to them.

Uranus was discovered by Sir William Herschel in 1781 (March 13th), and is the next planet beyond Saturn, being 1,783 million miles from the Sun. His diameter is over 33,000 miles, and his volume is about ninety times that of the Earth. His density is about $\frac{1}{10}$ that of the Earth, rather less than that of water, so that his mass is about fifteen times as much as that of the Earth, an amount which makes him more than outweigh Mercury, Venus, the Earth and Mars combined. All astronomers do not agree in their estimation of these numbers, Uranus being too far away for measurements to be more than approximate. Gravity on his surface is only three-quarters of what it is on the Earth, so that a ponderous beast on our planet could move about with springful alacrity if transported through space to that far-off planet. Uranus, being so far from the sun, naturally loses the benefit of his light and heat; in fact, to an inhabitant of Uranus—if there be one—the sun would merely appear as a bright star does to us. A great peculiarity exists in the arrangement of his satellites. Unlike those of other planets, they do not move approximately in the plane in which the planet travels, but circle him in a plane nearly at right angles to his orbit (about 76°).

Urao, a deposit which is found at the bottom of a lake near Nerida, South America. It consists of a hydrated carbonate of soda, and is also known as trona.

Urari. [CURARA.]

Urban, a name borne by eight of the Popes, of whom the first, who reigned from 222 to 230, suffered martyrdom. Urban II., who filled the chair from 1088 to 1099, by his action at the Council of Clermont (1095), was the prime mover in the establishment of the Crusades. Urban III., who succeeded to the papacy in 1185, was, till his death in 1187, engaged in a stubborn conflict with the Emperor Frederick I. Urban IV., who was Pope from 1261 to 1264, in vain tried to raise a new Crusade. A rigid disciplinarian appeared in Urban V., who held office from 1362 to 1370. Urban VI., elected in 1378, ruled till 1389. He caused great confusion in the Church by his obstinate resistance to the cardinals, who deposed him in 1378, the schism which divided Christendom for nearly forty years being the result. Urban VII. was a Pope of but 12 days' standing, dying on September 27th, 1590, before his consecration. Urban VIII. was probably the greatest of his name, a patron of art and literature, an excellent scholar and poet and a strong upholder of the temporal power. He succeeded Gregory XV. in 1623 and died in 1644.

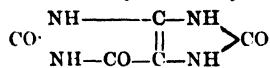
Urbino (the Roman *Urbium Hortense*), a city of Central Italy, in the compartimento of The Marches, formerly the capital of a duchy, and now the chief town of the province of Urbino-Pesaro, 20 miles S.W. of Pesaro. It is the seat of an archbishopric, and contains a ducal palace, cathedral and free university. Raphael was born here in 1483. Its manufactures comprise silk, pins, cheese, bricks and majolica, though the last is not the high-class ware for which the city was once famous. Pop. (1901), 5,089.

Urea. This compound had long been known as a constituent of the urine not only of mammals, but also of reptiles and birds, and had been early obtained from human urine. In 1828, however, it was synthesised by Friedrich Wöhler (1800-82), who showed it could be prepared from purely inorganic compounds. This, being the first artificial preparation of a so-called organic compound, was the first of the now very numerous preparations which demonstrate that between the organic and inorganic compounds there is no essential difference. To prepare urea from urine the liquid is evaporated to a syrupy consistency, and nitric acid is added, by which a salt of urea (urea nitrate) is precipitated. This is purified by recrystallising, and from it the urea itself is easily obtained. The artificial preparation is most easily effected by Wöhler's original method, *i.e.*, by heating ammonium isocyanate, when a molecular transformation takes place and urea is formed. The composition of urea is represented by CON_2H_4 , and the equation for this change is therefore $\text{NH}_4\text{NOC} = \text{CON}_2\text{H}_4$. It is a white crystalline compound, which forms rhombic needles, with a taste somewhat like that of saltpetre. It is very soluble in water and alcohol, but nearly insoluble in ether. It acts as a strong organic base, uniting with acids to form salts—*e.g.*, urea nitrate ($\text{CON}_2\text{H}_4 \cdot \text{HNO}_3$), a crystalline salt—urea oxalate $2(\text{CON}_2\text{H}_4) \cdot \text{C}_2\text{O}_4\text{H}_2$, a white, almost insoluble salt,

etc. Its solution, exposed to air, slowly decomposes, forming carbonic acid and ammonia, the same decomposition occurring with urine. Its constitution appears to be $\text{CO}(\text{NH}_2)_2$, but other views are urged by many chemists. It yields a large number of derivatives by substitution of hydrocarbon radicals for the hydrogen of the urea, many of these compounds being important physiological substances. The quantitative determination of urea in urine is a matter of considerable importance in medicine, and for it several methods are available.

Uri, one of the four Forest Cantons of Switzerland, lying south of Schwyz and east of Unterwalden, with which two it combined (August 1st, 1291) to form the original Swiss Confederation. The area is 415 square miles, and consists mostly of mountain and forest, with some arable land along the course of the Reuss. Mount St. Gotthard overshadows the southern border, and to the west runs the main range of the Alps. Dairy-farming, the raising of live-stock and the manufacture of explosives and parquet flooring are the chief industries. Altorf, or Altdorf (3,147), is the capital. In 1799 it was the theatre of war between the French and the Austro-Russian allies. The lake of Uri, forming really the south-eastern portion of that of Lucerne, has very precipitous shores and receives the waters of the Reuss. Pop. (1905), 20,635.

Uric Acid possesses the composition represented by $\text{C}_5\text{H}_4\text{N}_4\text{O}_3$. It is present, though not to a large extent, in human urine and in that of other mammals. In the excrement of birds and reptiles, however, it occurs in very considerable quantities, either free or combined with ammonia. From these sources the compound is best obtained, guano being most easily available for the purpose. The excrement is dissolved in hot dilute potash, and sulphuric acid is added to the solution, when the uric acid is precipitated as a white powder. It may also be prepared synthetically, but the reactions are by no means simple, and do not completely elucidate its constitution. It is almost insoluble in water, alcohol and ether and acts as a weak dibasic acid, but in most of its salts only one hydrogen is replaced. On heating, it decomposes into urea and other products. Its constitution appears to be best represented by the formula—



and is thus very closely allied to theobromine, theine, xanthine and other important compounds. It occurs normally in small quantities in the blood and muscle juices. Under certain pathological conditions it separates out between the joints and in the muscles, giving rise to that painful complaint the gout, while it also becomes at times deposited in the bladder, with the formation of gravel.

Urim and Thummim ("Light and Perfection" or "Doctrine and Truth") was the Hebrew name which denoted an instrument of divination which was in use among the ancient Hebrews, and which was in some way connected with the breast-

plate worn by the High Priest. Commentators on the Bible, which makes more than one mention of Urim and Thummim, are in doubt whether the name applied to the whole breast-plate or only to certain jewels upon it. Jewish writers consider that the oracle made itself known by exceptional brightness in the jewels. What was the form of Urim and Thummim is not known. Some have conjectured that they were little images, but for this surmise there seems scarcely any warrant. It has been more plausibly suggested that they were small flat objects, possibly tablets of wood or bone.

Urine. Healthy urine is a transparent straw-coloured fluid of slightly acid reaction, of a specific gravity of about 1.020. The quantity of the constituents is subject to variations in accordance with season and the amount of drink and exercise. The average composition in 1,000 parts by weight may be given, however, as 967 parts of water, about 15 parts of urea, and about 10 parts of other nitrogenous crystalline bodies, what remains consisting chiefly of mineral salts. About 52 fluid ounces of urine are passed by a healthy male adult in the course of 24 hours, containing some 512 grains of urea, about 8 grains of uric acid, 10 to 15 grains of hippuric acid, and about 150 grains of nitrogenous extractives, while of the mineral salts the large bulk is composed of chlorides, and there are small quantities of phosphates and sulphates, the bases with which the several acids are combined being the fixed alkaline bases, with a little lime and magnesia. It should be mentioned that the urine contains certain pigments derived from the pigment of the blood, and there is always a small amount of mucus shed from the mucous surfaces of the urinary passages. When urine is allowed to stand it throws down deposit, which contains mucus and in some circumstances phosphates, while in other circumstances it may contain urates and uric acid. Certain abnormal constituents are found in urine in disease. The most important of these are albumen, sugar, the pigments of the blood, and bile, and in some instances materials which can be detected on microscopic examination, and which may afford an important clue to the nature of the malady from which the patient is suffering. The presence of albumen is commonly tested for by ascertaining whether coagulation is produced by the action of heat or on the addition of nitric acid [BRIGHT'S DISEASE], while a number of tests may be employed to ascertain whether sugar is present, the most important being that known as Fehling's test. [DIABETES.]

Urochordata, a synonym of Tunicata. The urochord is the caudal chord of an ascidian or tunicate and may be likened to the notochord, or dorsal chord (the primitive backbone) of a vertebrate. It may therefore be regarded as representing the primordial spinal column of a vertebrate, and so to indicate the relationship of the Tunicata to the Vertebrata.

Urquhart, SIR THOMAS, the translator of Rabelais, was born at Cromarty, Scotland, in 1611, and educated at King's College, Aberdeen. He

afterwards spent some time in study and travel in France, Spain and Italy, returning to Scotland one of the most versatile men of his time. He was soon embroiled in the coercive measures against the adherents of the Covenant and, proceeding to London, was knighted by Charles I. in 1641. He spent another period abroad, occupying himself in the pursuit of abstruse learning. After the execution of Charles I. (1649), he attempted a Royalist rising which proved abortive and resulted in his being proclaimed a traitor. Being captured at the battle of Worcester (1651) he was committed to London Tower and afterwards to Windsor Castle, but was allowed considerable freedom on parole. In 1652 he was permitted to return to Scotland and in the following year issued two of his best-known works. One was called *Logopandectetion*, in which he sketched a universal language. The other was the translation of *The First Book of the Works of Mr. Francis Rabelais*, to which he owes his place in literature. His translation of the second and third books appeared later. He was himself another Rabelais in spirit, sentiment and style, and hence the extraordinary sympathy and success with which he translated the great humorist. It is believed that Urquhart died on the Continent in the early part of 1660.

Ursa Major, popularly known as the Great Bear, is one of the most familiar constellations of the northern hemisphere. It was known as the Bear or the Waggon to the early Greeks, being, like other constellations, named from some imaginary resemblance to the more common objects. It is now often spoken of as King Charles's Wain, the Waggon and the Plough. There are seven bright stars in the Plough, three of which are known as the "handle" and two as the "pointers."



URSA MAJOR.

The last are so named from the fact that a line produced through them passes very near the Pole-star. There are, however, many more stars than seven in the constellation; about sixteen can even be detected with the naked eye. The seven stars were called by the Romans the Seven Ploughing Oxen, or Septem Triones, and from this we get the word septentrional for north. URSA MINOR is less noticeable in the sky, its brightest star, α (the Pole-star) being only of the third magnitude. It has been called the Dog's Tail (cynosure), on account of the curve formed by three of its stars. Two thousand years ago it was the star β , and not α , which was

nearest to the celestial pole, and was therefore the "Pole-star." Neither the Great nor Little Bear is ever lost to view below the horizon to inhabitants of the northern hemisphere above the 40th parallel of latitude.

Ursidae, a family of Arctoidea, containing the Bears. There are five digits on each limb, all armed with strong, curved, non-retractile claws;



BROWN BEAR.

the tongue is smooth, the ears are small and erect, and the tail is short. They shuffle along with a waddling though often rapid gait, placing the whole sole of both the fore and hind feet on the ground, being in fact entirely plantigrade in their manner of locomotion. They are almost exclusively vegetarians, resorting to carnivorous practices only in the absence of their usual diet or under the stress of hunger not otherwise to be satisfied, though exception should be made in the case of the Grizzly Bear, which is so often addicted to flesh-eating that it may be regarded in this respect as a degenerate member of the family. The dentition of bears is modified accordingly and they are enabled to chew their food. They have a wide distribution in the northern hemisphere, but do not occur in Africa south of the Sahara, and are not found in Australasia or the islands of the Malayan Archipelago east of Wallace's line.

Urticaceæ, an order comprising 1,500 species in 108 genera, occurring in all parts of the world, but mainly tropical. Its members all agree in their apetalous flowers, with stamens equal in number and opposite to the sepals, and superior, one-chambered, one-ovuled ovary; but it includes such varied types that it has been termed "the marine-store shop of botanists," and is often separated into the orders Urticæ, Moreæ, Ulmaceæ, Celtidæ and Cannabinæ—i.e., the nettles, mulberries and figs, etc., elms, Celtis and hemp and

hops. These groups differ in their latex, stipules, albumen, and in the direction of their ovules. The Urticæ comprise over 40 genera and 500 species, with erect atropous ovules, albuminous seeds and very tough fibrous inner bark. With the exception of the two British genera, the nettles (*Urtica*) and pellitory (*Parietaria*), they are all essentially tropical. The most useful genus is *Boehmeria*.

Urticaria, or NETTLE-RASH, an eruption of wheals, often occurring in some persons after eating shell-fish or other food, and so named from its resemblance to the spots caused by the sting of a nettle. The redness suddenly appears in patches of varying size and shape, and usually has a raised flattened patch of white skin in the centre. The wheals tingle and burn and itch and must not be scratched. They go as suddenly as they come and last seldom for more than a day. It is almost always the result of gastric derangement. Generally a purge will suffice to clear the system of the disturbing element, and in future more care must be paid to the diet, and articles that plainly disagree be sedulously avoided.

Uruguay, or REPUBLICA ORIENTAL DEL URUGUAY, a republic of South America, bounded on the N. and N.E. by Brazil, on the E. by the Atlantic, on the S. by the Rio de la Plata and on the W. by the Argentine Republic, from which the river Uruguay, a natural boundary, separates it. It occupies an area of 72,210 square miles. Level on the coast, the country rises to the vast rolling plains of the Pampas, until it reaches the forest-clad ranges of the Cuchilla Grande and Cuchilla de Haedo. The Uruguay (which has a total length of about 950 miles) and its tributaries, chief of which is the Rio Negro, drain the district and provide water-carriage. Wheat, maize, barley, millet, oats and flax seed are the principal crops and fruits of all kinds can be grown abundantly along the river-courses, but the breeding of cattle, sheep and horses is the main source of wealth, great quantities of frozen and tinned meat being exported to Europe. Gold, silver, copper and lead constitute the leading mineral resources, which, however, largely await development. Originally a dependency of Buenos Aires, and under the Government of Brazil, the colony proclaimed its independence in 1825, and was recognised by the Treaty of Montevideo some four years later. Montevideo, the capital, is on the north bank of the Plata and has a population estimated at 270,000, to a very large extent composed of immigrants. Pop. (1904, estimated), 1,038,086.

Urus. [AUROCHS; BISON.]

Ushant (French, Ouessant), an island off the coast of Brittany, France, in the department of Finistère, 26 miles W.N.W. of Brest. It has a circumference of 10 miles and is $4\frac{1}{2}$ miles in length, the coast being steep and rocky and crowned by a lighthouse. Navigation is often dangerous, owing to the treacherous currents, and several disastrous shipwrecks have occurred in the vicinity of the islands. A number of sheep are pastured on the uplands, but the population is mainly dependent on

fishing. Lampaul is the chief centre. The French were defeated off the island in 1759 by Hawke, and an indecisive battle was fought in 1778 between Keppel and D'Orvilliers. Pop. (1901), 2,717.

Ussher, JAMES, archbishop, was born in Dublin on January 4th, 1581, and educated at Trinity College, of which he was amongst the earliest students. He took holy orders in 1601 and soon afterwards acquired a reputation as a powerful preacher both in Dublin and London. He bore a leading part in the organisation and management of Trinity College, where (1607) he was chosen first Professor of Divinity and of which he became at different periods vice-Chancellor and vice-Provost. In 1615 he drew up Articles for the Irish Church which proved to be of a pronounced anti-Catholic nature and in 1621 became Bishop of Meath and Clonmacnoise. In 1625 he was appointed Archbishop of Armagh, which in 1634 was assigned the primacy of all Ireland, the dispute on the subject with the see of Dublin being settled in this year in favour of Armagh. In 1640 he left Ireland, for the last time as it appeared. He was constantly engaged in a variety of ecclesiastical causes during his stay in London and died at Reigate on March 21st, 1656. His greatest work is the *Annales Veteris et Novi Testamenti* (1650, 1654), translated in 1658 as *The Annals of the World . . . to the beginning of the Emperor Vespasian's Reign*, which furnished the chronology of Scripture according to which 4004 B.C. was fixed as the date of the Creation.

Usury is sometimes employed to signify extortionate or illegal interest upon loans, and sometimes is taken as synonymous with the whole practice of lending money upon interest. The Fathers of the Church and canon law condemned the taking of interest, and the law of Moses placed certain restrictions on it and forbade Hebrews to exact it from their fellow-countrymen. Laws have at different times been passed in England to regulate the amount of interest legally recoverable.

Utah, a western state of the United States, bounded on the N. by Idaho, on the N.E. by Wyoming, on the E. by Colorado, on the S. by Arizona and on the W. by Nevada. It occupies an area of 84,970 square miles. It is traversed from north to south by the Wasatch Range, attaining in Mount Belknap an elevation of 12,200 feet, and has vast swelling prairies in the east. The Colorado, Green, Grand, Virgin, Jordan, Bear, Uinta and Sevier Rivers effect the drainage, and lakes abound, Great Salt Lake being the largest. On its shores stands Salt Lake City (53,531), the capital, and other important centres are Ogden (16,313) and Provo (6,185). Grazing is the chief industry, but the soil about the rivers is fertile, and yields good crops of wheat, oats, barley, maize, hay, potatoes and fruit. Wherever irrigation can be introduced the soil, naturally sterile, will repay the cultivator. The timber on the mountains forms a valuable product, and gold, silver, lead, copper and iron are worked with profit. The district was occupied by the Mormons, who still form the bulk of the population, in 1847, was organised as a Territory in

1850 and admitted as a State in 1896. Pop. (1900), 276,749.

Utahs (UTES), North American aborigines, forming a main division of the Shoshonean (Snake) family. They were formerly widespread, but never numerous, in the Colorado uplands, in North New Mexico, parts of California and Nevada, and in Utah, which state is named from them. The chief tribal groups are Gos Utes, still at large in Utah; Pai Utes, scattered over South-East California and South-West Nevada; Utahs, some in the Ute Agency, Colorado, some in the Ouray and Uinta Reserves, Utah.

Uterus. The uterus or womb is in the unimpregnated state a pear-shaped body, about three inches long, consisting of (1) an expanded upper part, the fundus, about two inches in breadth, (2) the body of the uterus, about one inch in breadth, and (3) the somewhat constricted cervix or neck, where the uterus is attached to the vagina. The cavity of the uterus communicates below by means of the os uteri with the cavity of the vagina, and on either side of the fundus it has opening into it the canals of the Fallopian tubes. The various diseases to which the uterus is liable form a part of the subject-matter of the science of gynecology. It may here be noted that the uterus is occasionally affected by displacement, that its structures may be involved in inflammatory processes, and that certain tumours may be developed in connection with it. Of the last-named the most important are the growths of fibrous and muscular tissue, known as "uterine fibroids," and certain forms of malignant disease.

Utilitarianism was first used, to signify a particular standard for judging actions, by Jeremy Bentham, who is said to have borrowed the expression from John Galt's *Annals of the Parish*, published in 1821; but the great exponent of Utilitarianism as a philosophical doctrine is John Stuart Mill. In his treatise upon the subject he sets up the general happiness as the goal towards which human actions should ever press steadily forwards, and the standard by which such actions are to be judged is their fitness in bringing about the end aimed at. According to this view, it is by no means necessary that this utility be the apparent and conscious motive of any particular action, but only that such utility be the ultimate standard by which it be tested. Bentham's *dictum* that "the greatest happiness of the greatest number is the foundation of morals and legislation" has acquired the currency of an accepted maxim.

Utrecht (Roman, *Trajectum ad Rhenum*), a province and its capital in the kingdom of the Netherlands. The former has an area of 534 square miles, being bounded on the N. by North Holland and the Zuyder Zee, on the W. by South Holland, on the S. by North Brabant and on the E. by Gelderland. Except in the south the surface is level and affords excellent pasture. The Lek, Eem and Vechte are the chief rivers. Pop. (1905), 276,543. UTRECHT city is the most ancient in Holland, and was the seat of a bishopric late in the

7th century. It stands on the Kromme, or Crooked Rhine, 23 miles S.E. of Amsterdam. Among many interesting buildings are the cathedral of St. Martin, two other cathedral churches, the Pope's House (built by Adrian VI.), the Mint, the University (founded in 1630), and the Stadthaus or town hall. The chief industries are plush-weaving, carpet-making, tobacco, chemicals and printing and publishing. Pop. (1905), 114,321.

Uttoxeter (locally pronounced "Ux-e-ter"), a town of Staffordshire, England, close to the borders of Derbyshire, within 1 mile of the right bank of the Dove, 13 miles N.E. of Stafford. It is a place of great antiquity, there having been a British settlement here as well as a Roman station. The principal buildings are St. Mary's Church, originally in the Decorated style, rebuilt in 1828, Alleyne's Grammar School, founded in 1558 and reorganised in 1886, and the town hall. The chief industries are brewing, brick-making and the making of agricultural implements. Uttoxeter was the scene of the well-known incident in Dr. Johnson's life. When a young man, he had once declined to accompany his father to his book-stall in the market-place. "Pride," he said in 1784, "was the source of that refusal. A few years ago I desired to atone for this fault; I went to Uttoxeter in very bad weather and stood for a considerable time bare-headed in the rain, on the spot where my father's stall used to stand. In contrition I stood and I hope the penance was expiatory." Pop. (1901), 5,133.

Uxbridge, a town of Middlesex, England, on the left bank of the Colne, 16 miles N.W. of London. The stream is crossed by a five-arched bridge and it is probable that the place took its name from a much earlier structure which impressed popular imagination as the bridge over the water (Gaelic, *uisge*, "water"). In January, 1645, the Commissioners of the Parliament and Charles I. met in the house now called the Old Treaty House and Crown Inn in a vain attempt to arrange peace. The chief buildings are the churches of St. Margaret, in Debased Perpendicular, and St. Andrew, in the Decorated, from the designs of Sir Gilbert Scott, and the town hall. There are flour mills, saw mills, planing mills and breweries, besides engineering, iron-founding, the making of agricultural implements and market-gardening. Pop. (1901), 8,585.

Uzbegs, a main branch of the Turki race, dominant since the 16th century in Western Turkestan (Khiva, Bokhara, Ferghana, Afghan Turkestan), originally nomads, but now mostly settled, engaged in agriculture and trade, and much mixed with the indigenous Tajik (Iranian) populations, as shown by their greatly modified Mongolic type. They claim descent from Uzbeg, a renowned chief of the Golden Horde (1312-42), under whom they first made their appearance on the Caspian Sea, and thence gradually overran a great part of the Turkestan lowlands. But many local traditions, as well as tribal names, point to an intermingling of Mongolic, Turki, and even Finnish tribes, amongst

whom the Turki element no doubt greatly predominated, as is evident from the universal prevalence of the Turki language (Chagatai dialect). This Turki element has been traced with much probability back to the Euz or Guz, an ancient Turki people, akin to the Uigurs, who were seated in the Tian-Shan uplands, and mentioned in the Chinese records under the corrupt name of Kiu-tze or Ku-tze some centuries before the Christian era. The Euz hordes had already reached the Sir-Darya (Jaxartes) in the 10th century, and it was from that point that they advanced round the Aral Sea to the Caspian; the kindred Turki people of the Volga still call them Oz. Although long settled and dwelling in large cities, such as Khokand, Khiva, Bokhara and Samarkand, the Uzbeqs still preserve the original tribal groups, of which over 100 are enumerated. One of these are the Uzi, and others, such as the Manghits, Kitais, Naimans, Kipchaks, Kungrads, Kulmaks, Uigurs, Kara-Kalpaks and Chagatais, clearly indicate a medley of Mongol and Turki tribes, so that the term Uzbek is regarded by Arnimius Vambéry and others rather as a political than an ethnical designation.

V

V, the twenty-second letter of the English alphabet, related to F as the voiced to the voiceless labio-dental consonant. It was the original form of U, and it is only lately that the two letters have been strictly appropriated to different uses. In Anglo-Saxon and Early English the sounds of both V and F are represented by F, which is voiced in the middle, voiceless at the beginning of a word. It is almost certain that the Latin V had the sound of W. This transformation from the labial to the labio-dental took place in the course of the formation of the Romance languages. V is also a labial consonant in Old Norse or Icelandic. When initial in modern German it is a symbol for the sound F.

Vaccination (Latin, *vacca*, "a cow"). Towards the end of the 18th century Edward Jenner (1749-1823), an English surgeon practising in Gloucestershire, was led to make inquiry into the truth of a notion to which his attention was directed, to the effect that milkers and others who had suffered from cowpox were incapable of contracting smallpox (variola). Jenner instituted a number of experiments, and published his results in 1798 in his work entitled *An Inquiry into the Causes and Effects of the Variolæ Vaccine*. In each of the two following years he published further papers on the subject, which was taken up by other observers, and speedily assumed considerable prominence. Jenner held that material taken from cases in which a certain eruption was found affecting the teats and udders of cows possessed the power, when inoculated into the human subject, of protecting from smallpox. The particular cow-disease in question he called *variolæ vaccinæ*; hence the title of his first paper, and hence the application of the term vaccination to this method of preventing an attack of smallpox.

The efficacy of vaccination was tested by numerous inquirers, who satisfied themselves that a person who had been submitted to the operation acquired protection against an attack of smallpox, as tested by a subsequent inoculation with smallpox matter; and vaccination during the early part of the 19th century gradually superseded the method of smallpox inoculation which had hitherto been largely adopted with a view to preventing a severe attack of variola. Vaccination was taken up abroad, and in the United Kingdom it obtained so much favour that it was enacted in 1838 that it should be provided gratuitously, and in 1854 it was made compulsory. In 1871 an Act was passed providing for the systematic enforcement of vaccination, and for the appointment of paid vaccination officers. On the other hand, the old operation of variolous inoculation, which had gradually fallen into disuse, was in 1840 made illegal on account of the risk of the communication of infection, from those who had been submitted to the operation, to unprotected persons. With the disuse of variolous inoculation the possibility of applying the test employed by the early observers, of insusceptibility to variolous inoculation subsequent to a successful vaccination, no longer existed. A mass of statistical evidence, was, however, becoming accumulated, showing the effect of vaccination upon the incidence of smallpox. While, however, this evidence clearly showed the importance of vaccination as a means of protection, it was found that such protection did not last for an indefinite period, and the desirability of repeating the operation after the lapse of a term of years became evident. It was, moreover, ascertained that in cases where smallpox attacked persons who had been vaccinated, but the protective influence of whose vaccination was not sufficient altogether to prevent the manifestation of the disease, the severity of the malady was in direct relation with the number, extent, and character of the vaccination marks. The importance of revaccination and of the proper performance of the operation of vaccination thus became recognised. Between 1889 and 1897 vaccination was made the subject of exhaustive enquiry by a Royal Commission. During recent years there has been, particularly in London, a marked increase in vaccination default. On the other hand, however, the removal of smallpox hospitals from crowded localities has had appreciable influence in limiting the spread of the disease; this has been especially notable in London since 1885, in correspondence with the adoption of the system of isolating cases of smallpox in the hospital ships in Long Reach, near Dartford in Kent. In 1898 an Act was passed effecting great changes in the law, mainly relating to the substitution of domiciliary vaccination for vaccination at public stations, the use of glycerinated calf lymph in all cases where required, the extension of the period within which a parent or guardian is required to cause a child to be vaccinated from three to six months from the birth of the child, and the exemption from penalties of conscientious objectors. In the outbreak of smallpox in London 1901-2, the efficacy of vaccination and more particularly of revaccination was confirmed.

Until within recent years vaccination was almost exclusively practised by arm-to-arm inoculation, lymph taken from the vesicles of one subject (usually on the eighth day) being inoculated into another subject; but the practice of inoculating directly from the calf has of late years been adopted in France, Germany and the United States, and since 1881 the British Government has had at work an animal vaccine station in London. At this establishment in Lamb's Conduit Street a large number of vaccinations directly from the calf are now performed, and in Prussia calf lymph is said to be exclusively used. The phenomena of a successful vaccination in a healthy infant are as follows:—At the site of the insertion a small elevation develops on the second or third day. On the fifth or sixth day this papule has become a vesicle, and presents a slight central depression. The vesicle attains maturity on the eighth day, when it is full of clear lymph, and is surrounded by a circular inflamed area which extends until its diameter is from one to three inches. About the tenth day the inflammation begins to pass away, the fluid of the vesicle, which has now become opaque, begins to dry up, and a scab is formed which separates, leaving a scar, at the end of about three weeks.

The altered age incidence of smallpox in correspondence with the increasing adoption of vaccination is a phenomenon which strongly corroborates evidence, and which it has not been found possible, by those who do not believe in the efficacy of vaccination, to explain away. In the supplement to the 14th Annual Report of the Local Government Board the following statement is made by Sir George Buchanan, then Medical Officer of the Board:—"The Registrar-General divides the period 1847 to 1880 (during which the causes of death were abstracted in combination with ages) into proportions—a first, namely, of six years (1847-53), when vaccination was optional; a second of eighteen years (1854-71), when it was obligatory, but not efficiently enforced; and a third of nine years (1872-80), when it was obligatory and more efficiently enforced by vaccination officers. For England and Wales the mean annual death-rate from smallpox of children under five years old in these several periods fell from 1,617 per million, at which it stood during the period of optional vaccination, first to 817 and then to 323; and the death-rate of children between five and ten years fell in a similar way from 337 to 243 and then to 186. The rates for children between ten and fifteen years in the three successive periods of time have remained without much change, having been 94, 88, 98. At higher ages of life, to which I shall immediately recur, there has not been decrease, but increase, in the rate of death by smallpox. Nevertheless, when all ages are considered together, the average annual death-rate by smallpox, 305 per million persons living, during the period of optional vaccination, is found to have fallen to 223 during the following period of obligatory vaccination, and during the period of enforced vaccination to 156."

This alteration in the age incidence of smallpox

is readily explicable when it is realised that the resistance to smallpox in adult life, which was afforded in prevaccination times by an attack of the disease in infancy, was practically complete, while it has been exchanged nowadays for the resistance furnished by vaccination, which has served to protect more especially the persons upon whom the operation has been comparatively recently performed, and has not extended the same degree of immunity to those in whom the effects of the operation have had time to become weakened. Thus, while in prevaccination times the preponderating incidence of the disease was upon childhood, among the vaccinated childhood is practically exempt, and smallpox is only fatal in later years when the protective influence of the operation has become diminished. The remarkable fact remains to be noted that among unvaccinated persons the original preferential incidence of the malady upon the earlier ages has continued to manifest itself. The other lines of argument which all point to the same conclusion may be briefly referred to. The effects of revaccination have now become abundantly evident, and it is clear that communities in which revaccination is carried out enjoy even greater immunity from the disease than those in which an original vaccination in infancy alone obtains. Prussia, in which revaccination was made compulsory in 1874, the British army and navy, and the case of attendants in smallpox hospitals, are instances in point. There are, again, the elaborate statistical results of Mr. Marson and Dr. Gayton, which show the influence exerted by the character and extent of the operation; the mortality from smallpox varying in close correspondence with the thoroughness with which the operation, designed to afford protection, has been performed. An outbreak of smallpox in Sheffield in 1887-8 was made the subject of an elaborate report by Dr. Barry, and the important evidence as to the value of vaccination afforded by the facts which he collected may be studied by those interested in the subject either in his original report or in the introduction to and summary of the report which is printed in the 18th Annual Report of the Local Government Board. Much has been written concerning the alleged risks of vaccination, but exhaustive inquiry has shown that when the operation is performed with proper care the risk is infinitesimal, and that it in no way admits of being weighed in the balance against the benefit which is conferred.

Vacuum means literally absolutely empty space; but the perfect realisation of this has hitherto been found to be experimentally impossible, although a point can be reached when the amount of gaseous matter left behind in a vessel is so small that it is almost unmeasurable, and is so attenuated that it has lost many of the properties usually ascribed to matter. By inverting a barometer tube carefully filled with mercury a space—known as the Torricellian vacuum—is left above a column about 30 inches high of mercury. This space, however, is not a perfect vacuum: it contains mercury vapour. Such a method of obtaining a vacuum is, however,

not of great practical utility, and different sorts of air-pumps have been invented, the Sprengel being the one most commonly employed. The extensive use of incandescent electric lamps has caused vacua to be of very considerable commercial importance, and has tended to cheapen and simplify the apparatus employed for their production. A vacuum is generally described as one of a certain fraction of an inch or of a millimetre: thus the vacuum of $\frac{1}{1000}$ inch obtained by Thomas Andrews (1813-85) when carbonic acid gas was removed from the receiver of his air-pump was simply one in which the pressure of the remaining gas was only sufficient to support a column of mercury $\frac{1}{1000}$ inch high. Since the initial pressure would have been about 30 inches it is seen that only about $\frac{1}{1000}$ of the original gas remained behind.

Vacuum-Pump, a pump consisting of a barrel, a suction-pipe with a valve, a discharge-pipe which has a valve, and a steam induction with a valve that is opened when the chamber is filled with water and closed when it is full of steam.

Vacuum-Tubes are glass vessels containing rarefied gases, and constructed to exhibit certain electrical phenomena. Platinum wires are fused into the glass, and when the tube has been exhausted to the requisite degree it is hermetically sealed. When the platinum terminals are connected to a source of high-pressure electricity—such as an influence machine or an induction coil [ELECTRICITY]—the tube is filled with a lambent glow, the colour of which depends, amongst other things, upon the gas with which the tube was filled previous to exhaustion, and upon the pressure of the gas. If the vacuum is very high, the discharge will not pass at all. The stream of light usually exhibits striae—that is, is not continuous, but divided into a number of sections, separated by dark spaces. Many curious effects may be produced by discharges in very highly exhausted tubes; the discharge then proceeds in straight lines, so that it will not go round a bend in the tube, and on meeting the glass, or an object placed in its path, a bright fluorescent glow is produced, accompanied by considerable heat. Discharges may be produced by induction in exhausted tubes with no electrodes, and in some cases the fluorescent effects may be produced outside the vessel.

Vagabonds, Vagrancy. The provisions of the law with respect to vagrancy are directed against "idle and disorderly persons," that is, persons who refuse to work, unlicensed pedlars, beggars, etc.; "rogues and vagabonds," *i.e.*, fortune-tellers, persons lodging in deserted buildings or the open air, without visible means of subsistence, etc.; "incorrigible rogues," *i.e.*, persons twice convicted of being rogues and vagabonds, persons who escape from imprisonment as rogues and vagabonds, etc. These offences are punishable with imprisonment and, in some cases, with whipping.

Vailima. [SAMOA.]

Valais (German, WALLIS), a canton of Switzerland, bounded on the N. by Berne and Vaud, on the S. by Piedmont, on the E. by Piedmont, Ticino and Uri, and on the W. by Savoy. It has an area of 2,027 square miles, mostly comprised within the wide valley of the Rhone, and shut in by lofty mountains, the Bernese Alps being a natural boundary on the north and the Pennine Alps on the south. Such famous peaks as Monte Rosa (15,217 feet), Matterhorn (14,705), Weisshorn (14,804), Finsteraarhorn (14,026), Jungfrau (13,761), Dent Blanche (14,318), and Dom (14,941) belong wholly or in part to Valais. The Simplon Tunnel traverses it in the east. Cattle-rearing is the chief industry, but the vine flourishes in parts, and the silk-worm is cultivated. There are manufactures of glass, soap and explosives. Sion (6,095) is the capital. The canton joined the Confederation in 1815. Pop. (1905), 117,514.

Valencia (*Valentia Edetanorum*), a province and its capital in Spain. The former, originally a separate kingdom, has an area of 4,150 square miles, being bounded on the E. by the Mediterranean, on the N. by Castellon and Teruel, on the S. by Alicante, and on the W. by Cuenca and Albacete. Mountainous to the north-west, it is remarkably fertile in the lower portions, and is famous for its oranges, almonds, olives, grapes and figs. Sheep and cattle thrive, and the silk-worm is reared in great quantities. Salt, marble and potter's clay constitute the chief mineral resources. The Guadalaviar and the Jucar are the largest rivers. Pop. (1900), 806,556. The city of VALENCIA stands within walls on the Guadalaviar, 2 miles from the Mediterranean, and has a fair port at La Grao, and an inner harbour. It is the seat of an archbishopric, and possesses a large Gothic cathedral founded in 1262, the Lorija de la Seda, or Silk Exchange, the Audiencia, or Parliament House of the old kingdom of Valencia, a university founded in 1500 and the finest botanical garden in Spain. Silk, linen and wool are woven into various fabrics, and amongst other manufactures are pottery, glazed tiles, tobacco and beer. Pop. (1900), 213,530.

Valenciennes (Latin, *Valentianæ*), a town in the department of Nord, France, at the junction of the Scheldt and Ronelle, 28 miles S.E. of Lille. Founded in Roman times, it became in the Middle Ages the capital of Hainault, and has stood many sieges. It is a first-class fortress, and the citadel planned by Vauban still exists. There is a fine town hall; and other public buildings, including churches, possess great interest. A considerable industry is carried on in linen fabrics, gauzes, merinos, iron-founding, engineering, sugar-refining, chemicals, distilling and the lace named after the town. Pop. (1901), 30,946.

Valency. The atoms of different elements have not all the same combining value; an atom of sodium, for instance, will unite with one of chlorine to form common salt; an atom of calcium needs two atoms of chlorine to form its chloride, while one of phosphorus will combine with either three or five. Sir Edward Frankland (1825-99), in 1852, pointed

out, as a deduction from his work on organo-metallic compounds, that metals combine with a definite number of atoms, and the same law holds if, instead of "atoms," we write "radicles." Further, radicles, which can be regarded as forming a complex body by substituting one or more atoms of hydrogen in a simpler body, are also found to possess the same combining power as those atoms of hydrogen. Thus, if a radicle can replace two atoms of hydrogen, it can combine with two atoms of chlorine, just as those two atoms of hydrogen can. Hence the substituting value of an atom or radicle is the same as its combining value, and this is known as its valency. An atom of oxygen or sulphur will either replace or combine with two atoms of hydrogen; so oxygen and sulphur are divalent. An atom of chlorine will replace or unite with only one atom of hydrogen; so it is monovalent, while for a similar reason carbon is regarded as tetravalent. The valency of an element is, however, not a fixed property as is its atomic weight. One atom may possess the combining powers of a different number of hydrogen atoms. Thus carbon in carbon monoxide replaces only two hydrogen atoms, and may be regarded as divalent, while in marsh gas it unites with four atoms, and is therefore tetravalent. Cases of disputed valency are by no means rare; nitrogen in ammonia is undoubtedly trivalent, but in ammonium chloride it is considered by some to be pentavalent, while others regard it as trivalent, the idea of "molecular" compounds being introduced to explain this latter view.

Valens, FLAVIUS, Roman Emperor in the East, was born about A.D. 328, and was appointed in 364 Emperor by his brother Valentinian, Emperor of the West. During the whole of his reign Valens was harassed by the Goths, who had obtained permission to settle in his empire. The treatment they received led to their revolt, and a long war was the consequence, culminating in the total defeat of the army of Valens near Adrianople in 378. Valens is believed to have fallen on the battlefield or to have perished in a house destroyed by the enemy. He was an Arian, and the Goths adopted the same creed.

Valentia, an island off the west coast of Kerry, Ireland, 3 miles S.W. of Cahirciveen. It is about 7 miles long by 3 miles broad, and has an area of 6,371 acres. On a height above Knight's Town are the ruins of a church of unknown age. Building-stone and slate are plentiful, but not much quarried. Only a small area is under cultivation, but the fisheries are of considerable importance. The climate is humid and relaxing, and so mild that fuchsias and other flowering plants reach a remarkable size and beauty. The scenery is very varied and contains passages of decided charm and grandeur. The harbour, between the isle and the mainland, is virtually land-locked and is deep enough to accommodate the largest liners. Valentia is best known as a station of the Anglo-American Telegraph Company, which possesses several cables communicating with the United States and Germany. Pop., 1,864.

Valentinian I. (A.D. 321-375), Roman Emperor, born in Pannonia, was raised to the purple in 364, and was occupied during the whole of his reign in resisting the encroachments of the Burgundians, Saxons and Alemanni, his headquarters being at Treves. He was a capable soldier, an honest administrator and a Christian. He died of apoplexy in 375. His son, VALENTINIAN II. (A.D. 371-392), succeeded him when he was four years old. He gained victories in Italy, Illyricum and Africa, but was in 387 swept out of Italy by Maximus. He was restored to his kingdom in the following year, and was murdered in 392 by Arbogastes. His grand-nephew, VALENTINIAN III. (A.D. 419-455), made incessant war on the Vandals, Goths and Huns, who succeeded in effecting the disruption of a great part of the empire. The Vandals overran Africa in 439, Britain was abandoned in 446, large areas in Spain and Gaul were irretrievably lost, and Sicily and the Mediterranean coast were repeatedly harried. In 451 Attila was defeated by the Emperor's general Aetius near Châlons, but in spite of this brilliant victory Valentinian eternally disgraced himself by murdering the "last of the Romans" in 454. Aetius was avenged next year when the Emperor was assassinated whilst watching the sports in the Campus Martius in Rome.

Valerian, the popular name chiefly of members of the genera *Valeriana* and *Centranthus*, belonging to the gamopetalous and epigynous order Valerianaceæ. They have perennial rhizomes, which in the British *V. officinalis* and others have a warm aromatic taste and a fetid odour, which has an intoxicating attraction for cats. The smell is apparently due to valerianic acid ($C_8H_{10}O_2$). The leaves are opposite, and the flowers small, white or red, and massed together. The calyx forms a feathery pappus in the fruit stage, and the corolla is saccate in *Valeriana*, spurred in *Centranthus*. There are three stamens in the former and one in the latter, whilst, of three carpels, two are generally suppressed, the fruit being a one-seeded cypsela and the seed exalbuminous. *V. officinalis* is cultivated near Chesterfield in Derbyshire, in Holland, and in the North-Eastern United States. Valerian is a powerful antispasmodic stimulant in cases of hysteria or epilepsy. The roots of an orchid (*Cypripedium pubescens*) are imported into the United Kingdom under the name of American Valerian.

Valetta (Italian, LA VALETA), the capital of the island of Malta, stands on a promontory between two bays on the north-eastern coast, and is surrounded by strong fortifications. The site is so uneven that many streets are flights of stairs, but it contains several fine buildings, such as the palace of the old Grand Masters of the Knights of Malta (Knights of St. John), the cathedral, the university and the hospital of St. John. The town was founded in 1568 by the Grand Master Jean Parisot de la Valette (1494-1568), who had heroically withstood for four months a siege by the Turks three years before. It was taken by Bonaparte in 1798, and wrested from him after a siege of two

years by the British, who still possess the island. Pop., including suburbs (1900), 66,700.

Valhalla (Icelandic, VALHÖLL, "Hall of the Slain"), in Norse mythology was the abode of the Einherjar—those who had fallen bravely in battle, and as a reward lived in perpetual joy with Odin. Hence the name became applied figuratively to any edifice set apart either as the last resting-place of the great men of a nation or as a place where they were commemorated. At Donauwerth, near Katis-

pulse, hemp, flax and vines. The Douro, Duraton, Eresma and Pisuerga are the chief rivers. Pop. (1900), 278,561. The city of VALLADOLID stands on the left bank of the Pisuerga, about 100 miles N.W. of Madrid. Among its public buildings are the cathedral (begun by Philip II. and never finished), the noble churches of Santa Maria, San Martin and San Benito, and the university (dating from 1346). Silk, cotton and woollen goods, jewellery and earthenware are the chief manufactures, and a large trade is done in agricultural produce. It was



[Photo]

ST. JOHN'S CHURCH, VALETTA.

[Richard Ellis, Malta.

bon, is the Valhalla, or Temple of Fame, built by Ludwig I. of Bavaria in memory of famous Germans.

Valkyries (Icelandic, VALKYRJUR, "Choosers of the Slain"), the "shield-maidens," usually nine in number, sent by Odin to every battlefield to choose the men who shall fall in the fight, and to determine the victory. They ride through the air and designate with their spears the doomed braves. When the battle is over, the Einherjar, or fallen heroes, are borne away by the Valkyries to Valhalla. Richard Wagner wrote one of the series of his famous Ring operas around the subject of *Die Walküre*.

Valladolid (Latin, *Pintia*), a province and its capital in the north-west of Spain. The former has an area of about 2,922 square miles, bounded on the N. by Leon and Palencia, on the E. by Burgos and Segovia, on the S. by Avila and Salamanca, and on the W. by Zamora. It is mainly level, and pastures numbers of horses, mules and cattle. The soil is very fertile and yields fine crops of cereals,

formerly the capital of Castile, and then of all Spain until 1560. Pop. (1900), 278,561.

Valle Crucis ("Vale of the Cross"), a ruined abbey in the parish of Llantysilio, Denbighshire, Wales, $1\frac{1}{2}$ mile N.W. of Llangollen. The name is supposed to have been derived from the physical configuration of the valley, which offers a fancied resemblance to the form of a cross. The Cistercian abbey was founded in the 13th century. It was a cruciform structure, mostly in the Early English style, with portions in Decorated and Perpendicular. The principal fragment is the west front, which contains a doorway with dog-tooth ornament, three lancet windows and, some distance above the latter, a rose window. The ruins stand at the foot of a hill in a romantic and sequestered glen.

Valleys, relative depressions among hills, are of various origin. They may occasionally result from the opening of earthquake-fissures or from the falling-in of the roofs of caverns; but, however originating or determined as to their direction, they owe their contours almost entirely to erosion

by sub-aërial agents, rivers, rain, frost, etc. Where they coincide with synclinals, as in the symmetrical flexures of the Swiss Jura, such as Balsthal, they

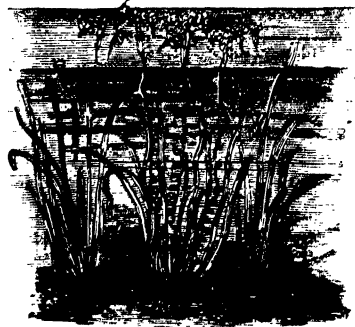


THE CANONS OF COLORADO.

might truly be termed valleys of elevation ; but this term is applied, on the contrary, to such cases as the valley of the Weald or the Vale of Woolhope in Herefordshire, which lie between the escarpments on a planed-down anticlinal. Though subterranean drainage may produce such valleys as the chines or bunnies about Bournemouth, or intermittent springs or "bournes," where the plane of saturation only rises temporarily above the surface of the ground, may originate such dry valleys as those in the English Chalk area, most valleys are river valleys. The general direction of these may be determined by lines of fault, as in that of the Jordan and perhaps in the four pairs of transverse valleys in the Weald, namely, the Wey and the Arun, the Mole and the Adur, the Darent and the Ouse, and the Medway and the Cuckmere respectively. These eight river valleys and those of the south of Ireland well illustrate the frequently greater antiquity of valleys than of hills or other existing surface features. The contours of valleys depend partly on the composition and structure of the rocks and partly upon the varying intensity of the various factors in erosion. Thus, as a rule, the harder the rock the narrower and steeper the valley, of which numerous

examples occur in the Scottish Highlands. Joints facilitate the cutting of ravines and the formation of such buttresses and pinnacles as adorn the dales of Derbyshire. The passage of a river from a harder rock on to the outcrop of a softer one will commonly result in a waterfall, which, as it is gradually cut back, will give rise to a chine, gorge, or defile ; whilst conversely the passage of the river from a softer to a harder rock may cause its expansion into a lake behind the barrier, as was once the case with the Medway behind the ragstone barrier at Yalding and behind the chalk barrier at Snodland. The steeper the slope of the surface, the straighter the course of a river, the greater its velocity and vertical cutting power. Though interrupted by cascades or leaps over rocky ledges, it will consequently flow mainly in a narrow steep-sided channel. Horizontal stratification may facilitate this type of erosion, whilst a general rising of the land would certainly do so. If the rainfall of the area be deficient, the channel will be not only deep but precipitous, as are the cañons of the Colorado. On the other hand, in softer rocks or where rain is plentiful, broader valleys with sloping sides may result. Where the ground is nearly a plain the river's course may wind excessively, the valley occupied at one time or another by the stream being of great width, as in the cases of the lower Thames, or the Indus, or in the well-marked instance of the links of the Forth. In such windings river-cliffs often occur on the concave bank, but seldom on both banks simultaneously.

Vallisneria spiralis, an aquatic plant belonging to the monocotyledonous order Hydrocharidaceæ, and native to Southern Europe. It is commonly grown in freshwater aquaria in England for the sake of its long grass-like leaves. These are very transparent and, under the microscope, exhibit very distinctly the rotation of the cell-sap.



VALLISNERIA SPIRALIS.

The plant is dioecious, the male flowers, which are borne on short stalks at the bottom of the water, breaking off and floating to the surface before their stamens burst, whilst the female flower-bud is carried up on the long, rapidly-growing, spirally-coiled peduncle, from which the plant is named.

The spiral colling adapts it to variations in the water; and after fertilisation the peduncle coils up, and the fruit ripens at the bottom.

Vallombrosa (Latin, *vallis umbrosa*, "the shady vale"), a valley, noted for its wealth of trees, in the slopes of Pratomagno of the Tuscan Apennines, in the province of Florence, Italy, 15 miles E. by S. of Florence. In 1039 Jean Gualbert founded in it the Benedictine monastery which was suppressed in 1869 by the Italian Government. The valley is familiar in consequence of John Milton's simile in *Paradise Lost* (Book I., lines 302-3):—

Thick as autumnal leaves that strow the brooks
In Vallombrosa.

Vallum, the rampart with which the Romans enclosed their camp. It comprised a larger rampart, or mound of earth, and an inner and smaller mound, separated from the former by a ditch. The whole was further strengthened by palisades and, in the case of camps likely to be required for some time, an outer wall was occasionally erected to make assurance of safety doubly sure. When an army had to sit down before a town to reduce it by siege, a rampart was often built around the place and this species of military engineering was called circumvallation. Care was had that the camp, in these circumstances, was fortified against attack from any force sent to attempt to raise the siege, so that the vallum might at one and the same time serve both an offensive and defensive purpose.

Valparaiso ("Valley of Paradise"), a province and its capital in the republic of Chile, South America. The former has an area of 1,953 square miles, and is bounded on the N. by Aconcagua, on the W. by the Pacific, and on the S. and E. by Santiago. Though broken by mountains, the country is exceedingly fertile, and possesses valuable mines of silver and copper. Pop. (1903), 252,009. The city of VALPARAISO, founded in 1544 upon a fine bay 70 miles N. of Santiago, is the chief port of Chile. It is strongly fortified, and has a naval arsenal, building sheds, docks, quays and harbour. Amongst the more notable monuments are those to the Navy crowned by the statue of Admiral Prat, to Christopher Columbus, to Thomas Cochrane, 10th Earl of Dundonald (1775-1860), the real founder of the Chilean navy between 1818 and 1822, and to William Wheelwright (1798-1873), who succeeded in organising in 1835 and the following years—despite the most serious obstacles—steam navigation on the Pacific coast of South America. The city was seriously damaged by earthquake, accompanied by conflagration, on August 16th, 1906. Metallic ores, wheat, chinchilla skins, wool, indigo and drugs are the chief exports, whilst European goods are imported for the whole of Chile. Pop. (1903), 143,769.

Valuation, the act of determining the price of any kind of property or the rent of land. This is necessary when persons become liable to probate and succession duty and similar taxes, and when a political appointment or privilege is dependent on a property qualification. In most cases, also,

trustees are required to seek professional advice before advancing money on the security of land.

Value, in its economic sense, is the relation in which any one object of wealth stands to all others in regard to the amount of each which must be given when they are exchanged. All desirable things have a "value in use," but they do not acquire "value in exchange" unless there is some difficulty in obtaining them. Thus it is only in exceptional circumstances that water is valuable in the economic sense. Money being the medium of exchange, the price of a commodity is the index of its value, allowance being made for the fluctuation of the market.

Valve is a device, of various kinds, for controlling the flow of a liquid or gas. When used in pumps, etc., it often consists of a conical hole, provided with an accurately-fitted stopper held in place by a spring or by gravity. Liquid trying to pass in one direction can raise the cone and open the valve, but pressure in the other direction keeps it more tightly closed. In another pattern a hole in a plate is provided on one side with a flap of leather or other flexible material, or in cases where great pressure is to be resisted a number of small holes are used instead of one large one. A stop-valve, used for controlling the supply of steam to an engine, etc., is a description of tap, a common pattern having a cone forced upon a slating by a screw when the valve is to be closed. The throttle-valve of an engine is a somewhat similar arrangement, which is opened or closed by the governor to adjust the speed. Such a valve is usually balanced, i.e., so arranged that the pressure of steam does not tend either to open or close it.

Vambéry, ARMINIUS, traveller and Orientalist, was born of Jewish parentage at Duna-Szerdahely, on the island of Schütt, near Pressburg, Hungary, on March 19th, 1832. His parents were poor, and he was intended for a tailor, but was enabled to secure a sound education at Pressburg, Vienna, Kecskemet and Budapest, and became a teacher of languages. He was expelled from Budapest on account of his connection with the revolutionary movement of 1848. He set out for the East in 1863, and made himself master of many of the Oriental tongues, travelling in the disguise of a dervish throughout the most inaccessible parts of Turkestan and returning to Europe in 1864. He was made Professor of Oriental Languages and Literature in Budapest University in 1865, a chair which he held till his retirement in 1905. He has published records of his journeys and other valuable works, philological and historical, including a *History of Bokhara* (1873), *The Central Asian and Anglo-Russian Frontier Question* (1874), and *Western Culture in Eastern Lands* (1906), in addition to autobiographical books, such as *Arminius Vambéry, his Life and Adventures* (1883), and *Struggles of my Life* (1904).

Vampire, in folklore, the ghost of a sorcerer, werewolf, suicide, or excommunicated person that sucks the blood of the living, and so causes them to pine away, the person thus attacked also

becoming a vampire, and after death preying upon others as he himself was preyed upon.

Vampire Bat, a bat belonging to the genera *Desmodus* and *Diphylla*, from Central and South America. The upper canines are very large, and



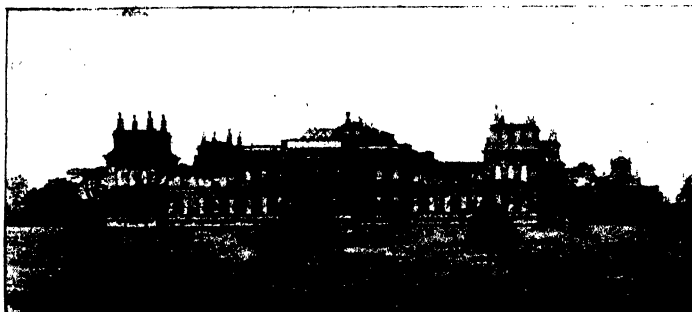
DESMODONT, OR BLOOD-SUCKING VAMPIRE.

the gullet is too small for anything solid to pass. These bats live entirely on blood, shaving off the skin of the victim, and sucking the blood from the small vessels exposed. They bite with remarkable rapidity and, even when they appear merely to brush the skin, a piece will, on examination, be found missing. They do not, therefore, hold fast with their teeth. Their excreta consist solely of a black, pitch-like paste, obviously digested blood. The floor of the caves which they inhabit is sometimes covered with this material to a depth of twelve inches or more. Dr. Hensel says that a large dog which had visited one of these haunts looked, when it emerged, as if it were wearing long boots. He thinks the creatures obtain the bulk of their food by capturing and sucking the blood of the smaller warm-blooded animals.

Vanadium (chemical symbol, V; atomic weight, 51.3). Although traces of this metallic element occur widely, and in many rocks and minerals, yet it is present to only a very small extent, and is found in quantity in only a few rare compounds, chief among these being the mineral vanadinite, a vanadate of lead, and notramite, a similar salt of lead and copper. Its existence was first indicated in 1801 by Del Rio, and thirty years later it was the subject of a careful research by Baron Berzelius (1779-1848). The metal is obtained with difficulty, the best method being the reduction of the chloride by hydrogen. It is a silver-white metal, stable in air under ordinary temperatures. It possesses the almost unique property of uniting readily with nitrogen when heated. It forms five oxides from V_2O to V_2O_5 ; and the highest oxides give rise to an

interesting series of salts, the vanadates, which may be regarded as derived from the hypothetical vanadic acid, H_3VO_3 , from the acid pyrovannadic acid ($H_4V_2O_7$), which is itself unstable, and from the metavanadic acid HVO_3 , a bright golden powder. The metal forms well-characterised chlorides and bromides, but the other salts have been only incompletely studied. The vanadium compounds may be recognised by the bright-green colour given to a borax bead when heated in a reducing flame.

Vanbrugh, SIR JOHN, dramatist and architect, was born in London in January, 1664, and educated probably at Chester Grammar School and in France, where he obtained his training in architecture. He joined the army in 1686 and was imprisoned in 1690 in France for travelling without a passport. He spent part of his time in the Bastille and was released in 1692. Though he resumed his military services, he took to writing plays and his *Provoked Wife* (his first important piece) was brought out at Lincoln's Inn Fields Theatre with marked success in 1697, followed in the same year by the *Relapse* at Drury Lane, by which his reputation was enhanced. The liveliest of his plays, *The Confederacy*, was given at the Haymarket in 1705. Meanwhile he had acquired a large practice as an architect and had little time to continue writing for the stage. Amongst his best-known designs were Castle Howard, begun in 1701 and completed in 1714, for the Earl of Carlisle; the Haymarket Theatre, opened in 1705; Blenheim Palace, begun in 1705 and carried on till 1712, when monetary troubles arose in connection with it, for the Duke of Marlborough; the earliest form of Floors in 1718, for the Duke of Roxburghe; Seaton Delaval in Northumberland (1720-1); Audley End (1721) for Lord Braybrooke, and his own two houses at Blackheath,



BLENHIM PALACE. (ARCHITECT: SIR JOHN VANBRUGH.)

(Photo: Gilman & Co., Oxford.)

"The Bastille" on Maze Hill and "Mince-pie House" (now Vanbrugh House). He also did some work for the old Clarendon Buildings in Broad Street, Oxford, and for Greenwich Hospital. He was knighted in 1714. He died at his house in Whitehall in London on March 26th, 1726. His love of the stupendous for its own sake in his

designs inspired the epitaph proposed for his tomb by the Rev. Dr. Abel Evans (1679-1737):—

Lie heavy on him, Earth ! for he
Laid many heavy loads on thee.

Van Buren, MARTIN, eighth President of the United States, was born at Kinderhook, Columbia, New York State, on December 5th, 1782, and studied for the bar, to which he was called in 1803. His rise both professionally and in politics was rapid and in 1812 he was a member of the State legislature, acting as Attorney-General from 1815 to 1819. In 1821 he was elected to the Senate and in 1828 became Governor of his native State. In 1831 he was Secretary of State under President Andrew Jackson and in the following year was selected as Vice-President. He succeeded Jackson in the Presidency in 1836, but failed to secure re-election in 1840. His name was associated with the pre-emption law which gave settlers priority of option in the purchase of their lands. His opposition to the Annexation of Texas cost him the nomination in 1844 and in 1848 his adoption by the Anti-Slavery section of the Democrats split his party. He spent most of the remainder of his life in partial retirement and died at Kinderhook on July 24th, 1862.

Vancouver, a seaport of British Columbia, Canada, on Burrard Inlet, an arm of the Gulf of Georgia. It is the Western terminus of the Canadian Pacific Railway and its harbour is equipped with commodious wharves and warehouses. There is regular communication by steamship not only with the principal ports of the Pacific coast of North America, but also with Japan, China and the Sandwich Islands. Its industries include engineering, sugar-refining, brewing, distilling, ship-building, canning, cooperage and railway plant. It has risen since 1885, when its site was occupied by primeval forest, and though already once devastated by fire (1886) is a flourishing community. Pop. (1901), 26,133.

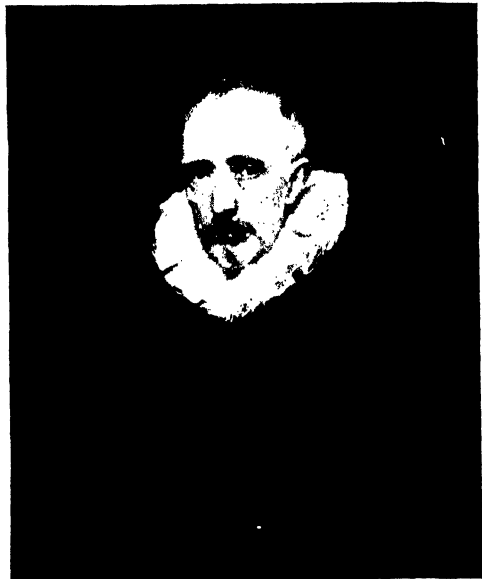
Vancouver, GEORGE, navigator, was born about 1758. At the age of thirteen he entered the Navy and accompanied Captain Cook on his second and third voyages. Promoted lieutenant in 1780 he spent several years on the Jamaica station, taking part in Rodney's battle with the French on April 12th, 1782. In 1791 he was appointed, in the *Discovery*, to the command of an expedition to the Pacific coast of North America, despatched partly to receive from the Spaniards territory they had seized and partly to explore the North-west. Early in 1792 he reached Nootka Sound and sailed around the large island since named after him. He then surveyed the coast from San Francisco northwards and returned to England in 1795. He died at Petersham in Surrey on May 10th, 1798, whilst engaged upon the proofs of his *Voyage of Discovery to the North Pacific Ocean and Round the World*.

Vancouver Island, off the west coast of British Columbia, Canada, from which it is separated by the Gulf of Georgia and Queen Charlotte Sound, being divided from the United States by the Strait of Juan de Fuca. Having a length of 275 miles, a

maximum breadth of 65 miles and an area of 12,000 square miles, it presents a deeply-indented coastline, with Nootka and Barclay Sounds to the west, and Victoria, Esquimalt and Nanaimo to the east. Traversed by a central ridge, 2,000 feet high, the country slopes down on either side to the sea, and has on its lower levels wooded hills enclosing rich pastures and fertile valleys. Victoria Peak (7,484 feet) towards the north is the highest summit in the island. Though rivers are scarce, the climate is moist, and both wheat and vegetables grow readily. Coal is worked, and copper and gold are among the mineral resources. Fish is plentiful on the coast and in the rivers. Victoria (20,816), the capital, is at the south-eastern extremity. First colonised in 1781 and circumnavigated by George Vancouver in 1792, Vancouver Island was united with British Columbia in 1866. Under the Oregon Boundary Treaty of 1846, the United States recognised the claim of the United Kingdom to the possession of the island. Pop. (estimated), 50,000.

Van Diemen's Land. [TASMANIA.]

Van Dyck, SIR ANTHONY, painter, was born at Antwerp, Belgium, on March 22nd, 1599. His artistic genius revealed itself at an early age and



CORNELIUS VAN DER GEEST.

(From the picture by Van Dyck.)

he studied under Hendrik Van Balen from 1609 to 1615, when he may (though the point is uncertain) have become a pupil of Peter Paul Rubens, for whom he no doubt executed a great deal of work. In 1619 he was admitted to the freedom of St. Luke's Guild in Antwerp, a rare honour for a youth, and in 1620 made his first visit to England.

James I. was not an ideal patron, however, and next year Van Dyck left Antwerp for Italy, the goal of all artists. Previous to his departure he had executed some excellent works, earning especially the good opinion of Rubens, with whom he was always on a friendly footing. In Italy he painted many fine portraits and other works, and returned in 1626 to Antwerp. His countrymen, aware of his genius, welcomed him cordially, and overwhelmed him with commissions. He is said to have visited England in 1629, but only for a short period, though the statement needs verification. He did, however, comply with the urgent invitations in 1632 and in that year took up his residence in the Blackfriars, London. On July 5th, 1632, he was knighted by the king and appointed court painter with an annuity of £200. He painted several portraits of quite transcendent excellence of the king, Henrietta Maria, and the royal family, and also a remarkable and unique series of historical English portraits, many of which are in the royal collection. He died in Blackfriars on December 9th, 1641, and was buried in old St. Paul's Cathedral. He left an only daughter, his wife being Mary, daughter of Dr. Ruthven and granddaughter of the Earl of Gowrie. His portraits are notable for their ease and grace, and his management of draperies was masterly. Few painters have excelled him in the painting of the head. He was a consummate painter of religious and historical subjects, though his fame has been overshadowed by that of Rubens. In the National Gallery in London Van Dyck is represented by (amongst others) the superb equestrian portrait of Charles I., acquired for the British nation from the Blenheim collection in 1885 for £17,500, the pathetic portrait of Cornelius Van der Geest and the portrait of Giovanni Battista Cataneo, purchased in 1907 in circumstances which the newspapers attempted to construe as mysterious.

Vane, Sir Henry, the Younger, statesman and author, the son of Sir Henry Vane (1589-1655), Secretary of State, was born in 1613 and educated at Westminster School and Magdalen Hall, Oxford. A residence abroad confirmed him in certain early republican views of his, but they were so unpopular with his friends that, in order to enjoy greater freedom of conscience, he emigrated in 1635 to Boston, where he became Governor of Massachusetts. He returned to England in 1637, became Treasurer of the Navy two years later (a post he held till 1650) and in 1640 entered Parliament and was knighted. Though a strenuous upholder of the Parliamentary cause during the Civil War, he took no part in the King's trial and neither assented to nor dissented from his execution. He was a zealous member of the Council of State and very active in foreign and colonial affairs. Ultimately on the question of the duration of the Long Parliament a rupture took place between Vane and Cromwell, who ended the *impasse* by dissolving the Parliament in 1653. In his retreat at his place at Raby he wrote the *Retired Man's Meditation*. In 1656 his *Healing Question*, hostile to the continued dominance of the army, led to his detention

in Carisbrooke Castle. After the Restoration his influence was deemed too dangerous and he was committed to the Tower of London. He was tried for high treason and executed on Tower Hill on June 14th, 1662.

Vanessa, a genus of butterflies containing the Red Admiral, Peacock, and Camberwell Beauty.

They present great variety of colour and markings, some being extremely showy if not handsome. The rims of the wings of the Comma Butterfly appear so tattered and torn that they look as if they must have undergone deliberate harsh treatment. The under surface is brown, black, greyish, or greenish, and the hind wings are always marked with a white C beneath.



VANESSA.

Van Eyck. [EYCK.]

Vanilla, a small genus of climbing epiphytic orchids, natives of tropical Asia and America, of which the most important is *V. planifolia*, a native of Mexico, now largely cultivated in Guadeloupe, Mauritius, Réunion, the Seychelles, Java, etc. The pod-like fruits are from 6 to 12 inches long and half an inch in diameter, dark-brown or nearly black in colour when dry, and covered with an efflorescence or *givre* of white, needle-like crystals. These consist of vanillin ($C_8H_8O_3$), the aldehyde of methyl-protocatechuic acid, a fragrant substance secreted by the placentas. Mexico vanilla, which is considered the best, only yields 1.7 per cent. of vanillin; Java vanilla, 2.75. The produce of Mauritius and the Seychelles finds its way mostly to London. The United States derives its supplies from Mexico. France relies mainly upon the yield of Réunion and Guadeloupe, and Holland naturally looks to her possessions in the East Indies for the satisfaction of her requirements. Vanillin can be prepared artificially from coniferin, which occurs in the cambium of fir-trees; it is prepared on a considerable scale in Germany from oil of cloves. It is used mainly to flavour chocolate, ices and confectionery.

Vapour is the term applied to those gases which are easily converted into liquids. The distinction between gas and vapour is thus merely conventional; there is no real physical difference. Until the last few years oxygen, nitrogen and a few similar substances were spoken of as "permanent" gases, but the liquefaction of oxygen is now a circumstance with which everyone is familiar; so that this most "permanent" of gases can be considered as the vapour of the beautiful blue liquid which it yields. A substance which usually exists in solid form, such as sulphur or iodine, requires heat to melt it or render it liquid, and further heat to convert it to vapour. The boiling-points of sulphur and iodine are therefore higher than the ordinary temperature of the air, but the boiling-point of liquid oxygen is

extremely low (-180° C.). Hence we see that the conventional distinction between gas and vapour resolves itself into this: Vapours are produced by substances whose boiling-points are about or above the normal temperature, while gases are the vapours of substances whose boiling-points are very low. If we have a liquid in a closed space, vapour will rise from it until the pressure reaches a certain value; the vapour is then said to be saturated, and its pressure is called the vapour pressure for that temperature. So long as some liquid remains we cannot increase or diminish this pressure, which therefore depends only on the temperature. [STEAM.] When the vapour pressure is equal to atmospheric pressure the liquid begins to boil. A vapour away from its own liquid and heated above its temperature of saturation is said to be superheated, and obeys the ordinary gaseous laws. [GAS.] Hence oxygen and nitrogen may be considered as superheated vapours. Many gases can be liquefied by pressure alone, as Michael Faraday (1791-1867) showed in the case of ammonia, etc.; and many by cold alone, e.g., steam; but many require both pressure and cold. For these there is a certain temperature, called the critical temperature, above which no pressure, however enormous, will succeed in producing one drop of liquid. There is also a corresponding critical pressure. It is worthy of note that at the critical temperature the volume of saturated vapour is equal to the volume of liquid formed from it. As a result of Thomas Andrews' experiments it has been concluded that no sharp line of distinction can be drawn between the states of liquid and vapour. At certain points it is certainly impossible to see whether a substance such as carbonic acid is liquid or gaseous, but physical tests show that at a certain point there is an abrupt change from gas to liquid. This point is on what is known as the critical isothermal.

Vaquero, a herdsman of the Mexican plains. The word is derived from the Latin *vacca*, "a cow," and the vaquero therefore corresponds to the American cowboy, though he commonly wears a more picturesque dress, suggestive of Spanish rather than Teutonic costume.

Var, a department in the South of France, bounded on the N. by Basses-Alpes, on the E. by Alpes-Maritimes, on the S. by the Mediterranean, on the W. by Bouches-du-Rhône, and on the N.W., to a small extent, by Vaucluse. It was created originally in 1790 out of a portion of Provence, and was reduced in 1860 by the formation of Alpes-Maritimes; the Var, from which it takes its name, no longer flows through the department. It covers an area of 2,333 square miles. The surface is rugged, rising in the north-east to a height of more than 5,600 feet, in the west to a height of 3,700 feet and in the Maures, on the coast, to a height of 2,550 feet. The chief rivers are the Argens, flowing from west to east, Nartuby, Verdon, a natural boundary on the north, Huvaune, Arc, Gapeau and Siagne, a natural boundary on the north-east. The coastal climate is remarkably mild and balmy and the scenery varied and beautiful and

there are numerous health resorts, of which Hyères and St. Raphael are the best known. The principal crops are wheat, oats, barley, maize, rye, potatoes and beetroot. Grapes, olives, strawberries, mulberries, figs, almonds, peaches and many other fruits are cultivated, while the palm, date, cactus, eucalyptus and other semi-tropical and tropical trees flourish, and there is a brisk export trade in flowers. The live-stock comprises sheep, cattle, mules, asses, horses, pigs and goats. Bee-keeping is carried on extensively and silk cocoons are largely produced. The minerals comprise iron, lead, aluminium and coal. The industries consist, amongst others, of textiles, shipbuilding, pottery, earthenware, tiles, glass, soap, chemicals, tanning, paper-making, cork-making, printing, brewing, distilling and the fisheries. Draguignan (9,671) is the capital, but Toulon (101,602) is much the most important town. Pop. (1901), 326,384.

Variation, the tendency of offspring to depart from complete likeness to their parents, a tendency the converse of heredity. The doctrine was of comparatively little moment when naturalists held the Linnæan and Cuvierian view of the fixity of species. It is true that Buffon (1707-88) insisted on the influence of the environment upon the organism, as did also Lamarck (1744-1829), in addition to his distinctive tenet of the importance of use and disuse in modifying organs. Erasmus Darwin (1731-1802) seems even to attribute something to conscious striving on the part of the organism. Whilst Gottfried Reinhold Treviranus (1776-1837) assumed indefinite variability, this was denied by Geoffroy St. Hilaire (1772-1844), who insisted on an action of the environment more direct than that assumed by Herbert Spencer (1820-1903). Thus St. Hilaire suggests that birds originated from saurians in consequence of diminution in the carbon dioxide present in the atmosphere. It was, however, Charles Darwin (1809-1882), who strengthened the theory of evolution by the theory of natural selection, that gave real importance to the study of those variations which constitute the raw material upon which natural selection has to work. Though collecting everything he could as to variations in a state of nature, Darwin found his most fruitful field of observation in plants and animals under domestication, and (in addition to the general summary of all his conclusions in the *Origin of Species*) published his evidence on this class of variations *in extenso* in a separate work. He came to the conclusions—(1) that variation is largely "spontaneous," or independent of external conditions; (2) that it is indefinite or indeterminate in direction; (3) that it is continuous, or by slight successive steps, thus postulating many generations and much time; (4) that changed habits, such as the use or disuse of organs, may produce an inherited effect—for example, as in the small wing-bones and strong legs of tame ducks; (5) that parts often vary together or in correlation—hair and teeth, for instance; (6) that domesticated organisms, being in unnatural conditions, are more variable than wild ones; and (7) that the reproductive system is

peculiarly susceptible to such changes of conditions. In the discussion of the origin of species, whether by the natural selection of variations or otherwise, the underlying question of the origin of variation was largely neglected; but early critics took exception to several of these conclusions (2, 3, and 4 especially). Thus Asa Gray (1810-88) and Karl Wilhelm von Nägeli (1817-91) argued for definite variation, along a determined line of perfectibility; and St. George Mivart (1827-1900) more conclusively urged that it is often discontinuous, or sudden and considerable. Henry Charles Fleeming Jenkin (1833-85) also urged that individual cases of variation would soon be swamped by crossing. Alfred Russel Wallace (b. 1823) afterwards brought forward further evidence in favour of discontinuous variation, the facts as to which were summarised by William Bateson (b. 1861) in his *Materials for the Study of Variation*. August Weismann (b. 1834) adduced strong arguments against the transmissibility of acquired individual characters, whether the result of environment or of habit, thus making all variation dependent upon the reproductive system. Patrick Geddes (b. 1854) has suggested (1888) that variation is definite and dependent upon the oscillatory balance between the vegetative and reproductive functions, the predominance of the latter resulting in progress.

Varicose Veins, the condition in which veins become permanently dilated as the result of obstruction to the flow of blood through them. Varicose veins are especially apt to occur in the lower limbs, in the veins of the spermatic cord, forming a tumour in the scrotum which is known as a varicocele, and in the veins of the rectum around the anus, constituting what are known as piles. In the case of varicose veins affecting the lower limbs, the obstruction to the circulation resulting from the condition is apt to lead, under the influence of slight exciting causes, to the existence of varicose ulcer. The treatment of varicose veins is either palliative or curative. The former consists in removing as far as possible all obstructions to the circulation, and in affording external support by the use of an elastic stocking or other suitable appliance. In some instances it is, however, necessary to adopt the so-called curative method of treatment and have recourse to surgical operation.

Variation, the admixture of different colours, especially of white, with the green of ordinary foliage-leaves, is generally of the nature of a disease. It is, however, distinguished from chlorosis by being more permanent and not markedly affecting the health of the plant. It sometimes affects an entire seedling, and is supposed in some cases to be due to a deficiency of iron or potash in the soil. More often it is confined to the leaves of one branch, which exhibit this character year after year. It is propagated with most certainty by grafts or cuttings; but variegated grafts sometimes affect the stock, a variegated stock may affect a graft, the variation is sometimes transmitted by seed, and is even said in some cases to infect merely neighbouring plants. Variegated pelar-

goniums, though fairly "true" when multiplied by cuttings, often bear wholly white leaves or shoots reverting to green. Variegated forms of *Euonymus latifolius*, or of the privet, frequently revert in a similar manner, shoot after shoot, especially when in luxuriant growth. The spotted *Aucuba japonica*, which is dioecious, was originally propagated entirely by cuttings, but when seedlings are grown the spots are often present, though generally in diminished numbers. Plants of variegated ivy are alleged to have infected others. Variegation generally follows the veining of the leaf, as is seen in ivies, in the "happy thought" geranium, and in the grass known as "gardener's garters." In hollies, ivies and other groups both yellow and white variegations occur. Variegation is probably due to the absence or modification of the chlorophyll, which, it has been suggested, may be the work of an entophytic parasitic alga or fungus. The dead-white spots on some species of *Caladium* seem to be produced by the presence of air beneath the surface of the leaf, and, like the irregular purplish blotches on the British "lords-and-ladies" and early purple orchis, are fairly constant throughout the species. The red spots in *Orchis maculata* are more rectangular, following the venation. Their function is unknown, but it has been suggested that they frighten field mice away by suggesting snakes. Chemically they may consist of an oxidation-product of chlorophyll or of a distinct colouring-matter, like the red in the leaves of the *Coleus* and the beet. In floral leaves also variegation follows the veins, occurring in conspicuous blossoms and serving as honey-guides to insect visitors. The white dots in rows on the petals of many species of *Dianthus*, the finely-ruled black lines on those of *Tropæolum* or *Viola*, and the combination of lines and splashes of more than one colour in the horse-chestnut and in the eye-bright are striking instances.

Variety, a departure from what is considered the type of a species in some slight particular, such as the size or colour of the flower in a plant, the size or colour-markings in a butterfly, etc. Some species are exceptionally prone to vary, the brambles presenting in this respect, for instance, a considerable contrast to their ally, the raspberry. This variability is intensified under domestication or cultivation, as in pigeons, barn-door fowls, dahlias, chrysanthemums, etc. Flowers originating in this way are often termed "florists' flowers." Long-continued cultivation stereotypes groups of varieties into what are known as races; but, though the ancestry of such domesticated forms may be well known, in the case of varieties occurring in a wild state it is purely a subjective question, or matter of taste, with the individual naturalist whether they are or are not to be ranked as species.

Variola. [SMALLPOX.]

Varley, JOHN, artist, was born at Hackney, London, on August 17th, 1778. On his father's death in 1791 he was employed by a portrait painter and afterwards became the assistant of Joseph Charles Barrow, a landscape painter.

Sketching in the open developed his true bent and he travelled constantly in search of subjects in landscape and architecture. His capacity for work was extraordinary and his output enormous. He was an excellent draughtsman and colourist and had a fine sense of composition. He exhibited frequently at the Royal Academy till 1804, when he helped to found the Watercolour Society (afterwards the Royal Society of Painters in Watercolours), to which he almost exclusively confined himself. He was even more successful as a teacher than as an artist, obtaining a guinea a lesson and sometimes as high a fee as £200 with an arted pupil. Among his most distinguished pupils were William Mulready (who married his sister), William Henry Hunt, John Linnell and Samuel Palmer, whilst he had a hand in the training of David Cox, Copley Fielding and Peter de Wint. The English school of watercolour painters is therefore heavily his debtor. His latter years were passed amidst a good deal of pecuniary trouble, for though he made money and spent little of it on himself, he was free-handed and helpful almost to a fault. He died in London on November 17th, 1842. He was the author of *A Treatise on the Principles of Landscape Design* (1816-21), *A Practical Treatise on the Art of Drawing and Perspective* (1815), and *Precepts of Landscape Drawing* (1818). Astrology was his hobby and he was always willing to draw anyone's horoscope. He taught it to Sir Richard Burton and Lord Lytton, the novelist. His nephew CROMWELL FLEETWOOD VARLEY (1828-83) was an eminent electrical engineer and an inventor of several telegraphic appliances. His cymaphen, patented in 1870, is said to have practically anticipated the principle of the telephone. He was one of the consulting engineers in connection with the laying of the second Atlantic cable, the first having proved a failure.

Varna, a seaport of Bulgaria, on the Black Sea, about midway between the mouth of the Danube and the Bosphorus, 48 miles E. of Shumla. The town occupies the slope of a hill facing the sea and has a mixed population of Greeks, Bulgars, Turks, Jews and Gipsies. Sheltered from the north and north-east winds the roadstead is safe and the town is the busiest port between Odessa and Constantinople. The industries include distilling, tanning, brewing and soap-making. In 1444 the Turks under Murad II. defeated the Hungarians commanded by King Ladislaus and John Hunyady. During the Crimean War it was occupied by the Allies, who organised their plan of campaign here. It was ceded to Bulgaria in 1878. Pop. (1905), 37,155.

Varnishes are liquids which when painted over surfaces, as wood, metal, etc., dry to a hard, glossy coating. They are frequently employed on this account to protect the material, as this coating is impervious to moisture and prevents decay, rust, etc., while they are as frequently used for decorative purposes. Varnishes should possess the qualities of hardness, toughness, sufficient elasticity to prevent cracking, and they should dry sufficiently quickly after application. They are usually prepared by dissolving resinous materials in drying-oils,

spirits, turpentine, benzene, etc. Spirit varnishes dry very rapidly, and have usually a very bright and brilliant surface; they are hence chiefly employed for decorative purposes. The resin employed is usually shellac, with the addition of varying quantities of Canada balsam or mastic. The various stains and coloured varnishes employed for woodwork usually consist of such spirit varnishes to which pigments or aniline dyes have been added. Turpentine is frequently used as a solvent for the common resins, but the varnish requires the addition of some linseed or other oil, owing to its lack of tenacity. It is often added to other varnishes to give brilliancy. The oil varnishes are usually prepared from linseed oil, though other drying-oils may be employed. In these the solvent does not completely evaporate, but simply hardens and remains as a constituent of the film. Copal varnish, the most useful and best-known of the oil-varnishes, is prepared by adding together in small quantities boiling linseed oil and melted copal resin, and stirring until solution is effected, and turpentine is afterwards added. Amber may be employed instead of copal, and forms an excellent, tough, tenacious and glossy film, but is more expensive than the commoner preparations. Mastic may be also used, but is best dissolved in turpentine or in methylated spirits. Paintings should never be varnished until they have become thoroughly dry. Those artists who used bitumen in their varnish may not have lived to see the ruin of their works, but the owners of the pictures thus treated have often had bitter cause to deplore their authors' ignorance or haste. Before varnishing, woody substances should be painted over with a "size," usually a solution of isinglass or glue, so that a uniform surface is formed to receive the varnish, which would otherwise appear of a patchy consistency. The varnish employed for the Japanese lacquer is obtained from a native tree (*Rhus vernicifera*), and forms a very bright, hard and tenacious film. [LACQUER; JAPANING.]

Vasari, GIORGIO, painter and architect, was born at Arezzo, Italy, on July 30th, 1511. He was a pupil of Michael Angelo and executed various decorations for the Medicean palaces in Florence. He was also the architect of the splendid buildings of the Uffizi Palace in that city and the Abbazia at Arezzo. He painted several important pictures, but his fame rests very largely on his invaluable work on artists—*Vite de' Più Eccellenti Pittori, Scultori, ed Architetti*, which appeared in 1550, and has been often reprinted. He died at Florence on June 27th, 1574.

Vaseline. After the distillation of petroleum for the preparation of the various illuminating oils, etc. [PETROLEUM], a viscid, dark brown mass is left behind in the stills. This is treated with superheated steam, and is, while still hot and liquid, decolorised by filtering through animal charcoal. On cooling, it forms the pale-yellowish, buttery substance known as vaseline. Chemically it consists of a mixture of hydrocarbons containing from 16 to 20 atoms of carbon in the molecule. It melts at about 35° C., and decomposes if heated

strongly. It is insoluble in water, but dissolves readily in benzene, turpentine and many organic solvents. It is employed as a lubricant and also for the preparation of ointments and cerates in medicine. Mixed with small quantities of carbolic acid, it is used as an antiseptic, and (pure) as a substitute for cold cream and glycerine for toilet purposes.

Vasomotor Nerves, the nerves supplied to the muscular coat of the blood-vessels.

Vatican Council, the council of the Roman Catholic bishops which promulgated the doctrine of Papal Infallibility. It met on December 8th, 1869, and was adjourned on July 18th, 1870, and further prorogued on the following October 20th. After the unification of Italy, consequent on the occupation of Rome on the 20th of the preceding month, Pius IX. took up an irreconcilable attitude. He had been mainly instrumental in the convocation of the Council—convened, it must be remembered, not from any overmastering necessity or from the desire of the Church, but with a view to establishing the temporal power of the Papacy on the basis of an autocracy, ostensibly of spiritual, but really of mundane character. The Pontiff now deemed it prudent to pose as the "prisoner of the Vatican" and to involve himself with several of the Great Powers, especially Germany and France. In these respects Pius IX. compared to poor advantage with most of his predecessors. They had always displayed a profound knowledge of men and an accurate appreciation of the political situation in countries in which the Church had a large following. This practical shrewdness and this historical sense appeared to have vanished, otherwise the world would have been spared the conflict with the French Republic and the German Emperor. Since a quarrel had been provoked the issue was inevitable. It was impossible either for Germany or France to enter the lists and come out defeated. This obvious fact—a truism it should rather be called—eluded the comprehension of the Pope, and the spirit usually known as Vaticanism which inspired the interference of the Papacy in the affairs of other countries precipitated a policy of resistance which, in the circumstances, could not fail to do the Church immediate, if not, indeed, lasting injury. It is idle to speculate on what would have happened had the Vatican Council never met, but it is at least reasonable to suppose that the dissension between Church and State would, in that case, have been averted both in Germany and France.

Vauban, SÉBASTIEN LE PRESTRE DE, military engineer, was born at Saint Léger de Fougeret, Nièvre, France, on May 1st, 1633. At the age of seventeen he fought in the ranks of Prince Condé, then making with the Spaniards common cause against France. Showing a unique talent in the art of fortification, he gained great repute as an engineer at the sieges of Sainte-Menehould, Stenay, Clermont, Landrecies, Valenciennes, Gravelines, Yprés, Oudenarde and elsewhere, and after the Peace of the Pyrenees (1659) was occupied in building new fortresses and strengthening old ones. On the

renewal of hostilities (1667) in Flanders he again distinguished himself at the sieges of Tournai, Douai and Lille, and by 1673 had rendered the French frontier on this side practically impregnable. In 1674 he captured Maestricht, his most considerable achievement, and three years later succeeded Clerville as Engineer-in-chief. During the spell of peace that followed the Treaty of Nimeguen (1678) he managed to complete his scheme for the fortification of France. When war again broke out both Mons and Namur (1691-2) fell before his prowess, and his active career was ended by the Peace of Ryswick (1697). He was created Marshal of France in 1703 and died in Paris on March 30th, 1707. He was the author of several technical treatises, amongst which may be named *Traité de l'attaque et de la défense des places* (1739), *Traité des Mines* (1740), *Essais sur la fortification* (1739), and *Traité des sièges* (1747).

Vaucluse (Latin, *Vallis Clausa*), a department in the south-east of France, taking its name from the picturesque grotto and spring which Petrarch immortalised. It is bounded on the N. by Drôme, on the E. by Basses-Alpes, on the S. by Bouches-du-Rhône, on the W. by Gard, and on the N.W. by Ardèche. The Durance on the south and the Rhône on the west are natural boundaries. It has an area of 1,381 square miles. In the east the surface is mountainous, reaching in Mont Ventoux, on the summit of which a meteorological observatory has been built, a height of 6,273 feet. The principal streams are the Aygues, the Sorgue (which rises in the fountain of Vaucluse), the Ouvèze and the Coulon, in addition to the two great rivers already mentioned. The chief crops are wheat, oats, millet, barley, rye, potatoes and beetroot. In the valleys the olive, fig, oleander, pomegranate and other sub-tropical trees grow, while grapes are extensively cultivated. Live-stock are raised to a moderate extent. Lignite, coal, iron and sulphur are worked, and mineral springs are numerous. The manufactures include silk and other textiles, paper, madder dye, oil, flour, pottery and earthenware, chemicals, soap, confectionery and tinned provisions, besides iron-founding, brewing and distilling, saw-mills and nursery gardens. The capital is Avignon (46,896). The department, which is rich in Roman remains, was created in 1793 out of the county of Venaissin, the principality of Orange and a portion of Provence. Pop. (1901), 236,949.

Vaud (German, *WAADT*), a canton of Switzerland, with an area of 1,244 square miles, bounded on the N. by Neuchâtel, on the E. by Freiburg and Berne, on the W. and N.W. by France, and on the S. by the Lake of Geneva and Valais. Except where the skirts of the Jura and the Alps extend, the surface is level or undulating. In the extreme south-east the Diablerets reaches an altitude of 10,650 feet above the sea. The streams include the Broye, Nozon and Orbe, and the Rhône bounds it during part of its course. Agriculture is the chief occupation and wine-making the leading industry, the canton being one of the largest vine-growing districts in Switzerland. Apart from watch-making,

the industrial pursuits are unimportant. Educational facilities exist on a considerable scale at Lausanne (53,209), the capital, Yverdon (associated with the labours of Pestalozzi) and elsewhere. Marble, coal, sulphur, iron and asphalt are worked, and there are several well-known mineral springs. Vaud entered the Swiss confederation in 1803. Pop. (1905), 296,012.

Vaudois. [WALDENSES.]

Vaughan, HENRY, poet, was born at Skethiog on the Usk, in the parish of Llansaintffraed, Brecknockshire, Wales, on April 17th, 1622, and was educated privately and at Jesus College, Oxford. He apparently took some part in the Civil War, and was imprisoned by the Parliamentarians, but little is known for certain about this part of his career. In 1646, being then in London, he published his first volume, *Poems*. He afterwards returned to his native place and practised as a doctor, and seems to have lived there till his death on April 23rd, 1695. His first poems were non-religious, which he regretted, and consequently published the fine sacred poetry, which has given him so high a rank among English poets. His later volumes of poems are *Silex Scintillans* (1650), *Mount of Olives* (1652), *Flores Solitudinis* (1654), and Part II. of *Silex Scintillans* (1655). He is sometimes called the "Silurist," from his having been born in that part of South Wales which was occupied by the native tribe of the Silures.

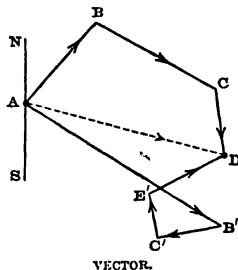
Vauxhall Gardens, a favourite pleasure resort of Londoners in the 18th and 19th centuries, about half a mile south of Lambeth Palace. The manor-house dating from the reign of John belonged to a Norman family named Faux (Fulkes or Falkes) and ultimately came to be corrupted into Vaux Hall. In 1675 the mansion passed into the possession of Sir Samuel Morland, who turned it into something of a show-place. One room was entirely fitted up with mirrors and Sir Samuel occasionally, according to John Evelyn, entertained the Merry Monarch and his gay ladies. The grounds were laid out in gardens, and shady walks were constructed amidst stately trees, long the haunt of nightingales and other songsters. The property was acquired in 1732 by Jonathan Tyers who transformed it into an alfresco recreation ground. He built a large banqueting hall and numerous pavilions or boxes for supper parties. William Hogarth painted several pictures for the boxes and also designed the admission card. A fantastic structure was provided for the orchestra and Neptune's and other flamboyant fountains adorned the grounds, in addition to a statue of Handel, rather a fine work by Roubiliac. People promenaded in the groves, danced on the sward, or listened to the most celebrated vocalists of the day (Incedon and Braham both sang frequently) and ended the evening by suppers. The slices of ham were noted for their transparency and, as a tribute to the skill of the carver, it was a standing joke that he could cover the eleven acres with slices from a single ham. Latterly the gardens were grandly illuminated and fireworks were added to the regular features, while rope dancers and

acrobats were often requisitioned as extra attractions, balloon ascents being also made from time to time in the decadent days of the place. The Prince Regent and his crowd were constant patrons and good people of the middle class mingled with the throng. It is recorded that on June 29th, 1849, when Charles Dickens took Sir Edwin Landseer, Clarkson Stanfield and Judge Talfourd to spend the evening he was agreeably surprised to find that the Iron Duke and Lady Douro had been induced to see the tableau of the "Battle of Waterloo." The gardens gradually acquired a notorious reputation and lost caste and character, and were finally closed in 1859. Their original name was the Spring Gardens, Vauxhall, although no mineral water was ever discovered at the spot. Their site, near Vauxhall railway station, has been built over.

Vector is a mathematical term used to express any quantity which has magnitude and direction; it can therefore be represented by a straight line of definite length drawn in a definite direction. The line A B may be taken

to indicate that we have moved from one position in space, A, to another, B. Its length indicates how far we have moved, and the angle it makes with any fixed line shows the direction. If we stated that we moved in a north-easterly direction, we should mean that the line A B should make an angle of 45°

with the meridian line N.S. pointing north and south. A B is hence a directed step or vector. At B another directed step, B C, may be taken, and this new vector is as rigidly defined as A B, while a third step may take us along C D to D. The arrow-heads indicate the sense in which the steps are taken, i.e., that we go from B to C, and not in the opposite way. We might express the sum of these three steps as $A B + B C + C D$, but we must remember that we are dealing with vector quantities, and not mere distances in the same straight line, which would be scalar quantities, so that if $A B = 150$ yards, $B C = 200$ yards, and $C D = 100$ yards, the expression $A B + B C + C D$ does not mean $150 + 200 + 100$ or 450 yards; it means that we have taken successive steps of 150 yards to the N.E., then 200 yards in a different direction, and finally 100 yards after another turn. But the point D might have been reached by the single step A D, i.e., by going along a "bee" line from A to D. So the result of the three steps, A B, B C, C D, is only the same as that of the one, A D. This we can express as $A B + B C + C D = A D$, still bearing in mind that we are not adding quantities in the usual algebraical sense. Since the goal D might have been reached by the roundabout method of the steps A B, B' C', C' E', E' D, we can also write that the sum of the vectors representing the first steps is equal to the sum of those



representing the second series or $AB + BC + CD = AB' + B'C' + C'E' + E'D$, both of which are equal to the vector AD . If the steps AB, BC, CD, DA , had been taken, we should have returned to our starting-point, so that the same result would have been obtained if we had not moved at all or taken a step $= 0$. Hence we may write $AB + BC + CD + DA = 0$, but we found before that $AB + BC + CD = AD$. Hence we see that $AD + DA = 0$ or $AD = -DA$. Thus going along AD and returning again gives us a zero result, and, if we consider motion along AD to be in a positive direction, that along DA must be regarded as negative. Two vectors are obviously equal if they have the same length, direction, and sense. If, instead of taking the steps AB and BC , we took AD equal to BC in length, direction, and sense, we could then take the step DC , which is obviously—from geometrical considerations—equal to AB in every way. Since we have reached the point C in both cases, we can write $AB + BC = AD + DC$; and since $AD = BC$ and $DC = AB$, this is the same as saying $AB + BC = BC + AB$. Hence it does not matter in what order we take any number of steps or carry on the addition of vectors. The laws for the multiplication and division of vectors are treated of in the branch of higher mathematics known as quaternions, and were first deduced by Sir William Hamilton.

Vedas (from an Aryan root signifying both “to see” and “to know,”), the sacred books of the Brahminical religion. They are four in number—the Rigveda, or Veda of Praise; the Samaveda, or Veda of Chants; the Yajurveda, or Veda of Prayers; and the Atharvaveda, or Veda of the Atharvans (a priestly family). Collectively they are known as The Veda. Each Veda comprises two portions—the Samhita, consisting of mantras or hymns to the gods; and the Brahmana, which is a prose commentary on the Samhita. Distinct from the Brahmanas, though closely connected with them, are the Aranyakas or “forest treatises,” so called from their abstruse character, requiring the learner to retire to the remotest solitudes; and the Upanishads, which deal with the nature of the Brahman or Supreme Being. The Sutras, on the other hand, are compositions of later date, laying down precise rules as to the conduct of the ritual. The Hindus regard all the Vedas as inspired; but the Rigveda is the most ancient, and on its Samhita those of the Samaveda and the Yajurveda are to a great extent based. It contains 1,028 hymns addressed to Indra, Agni, Soma, Varuna and other deities representing natural forces which have as yet hardly assumed a personal form. The system of belief preserved in these hymns, which were probably collected about 1000 B.C., is purely Aryan. In the Atharvaveda-Samhita, on the other hand, prominence is given to an evil element in Nature, which it is thought may have been due to contact with non-Aryan tribes.

Veddahs, i.e., “Hunters,” aborigines of Ceylon, representing the Yakkos or primitive inhabitants of the island before the Aryan (Hindu) conquest. They are now confined to the district between Kandy and the east coast, and their numbers hardly exceed 2,000. In the interior they are still

in the wild state, living on fruits roots and the produce of the chase; but those on the coast in the Batticaloa district are settled in villages and partly civilised. The type approaches that of the dark aborigines of the neighbouring mainland, where there are also some Veddah (hunting) groups, and the language appears to be a pure Sinhalese dialect unaffected by Sanskrit or Pali elements.

Vedder, ELIHU, artist, was born in New York on February 26th, 1836, and educated at Brinkerhoff School, Brooklyn. His artistic training was acquired under Mattison at Sherburne, New York State, and Picot at Paris. From 1856 to 1861 he was engaged in sketching and studying in Italy and then went back to the United States for a few years. In 1867 he returned to Rome, where he finally set up his studio. His subjects are chiefly imaginative, frequently conceived on classical lines, and are largely derived from Greek and Roman mythology. Amongst his public commissions were the five decorative panels and the “Minerva” (in mosaic) for the New Congressional Library at Washington. He has done some black-and-white work, his principal achievement in this branch being an illustrated edition of Edward Fitzgerald's *Omar Khayyám* (1884).

Vedettes, mounted sentinels sent out to observe and skirmish in advance of the outposts of an army. They are sometimes engaged, but an affair of vedettes, as these brushes with the enemy are styled, is necessarily a matter of no great consequence, beyond serving the useful purpose of giving an alarm. Frederick the Great's motto was *Toujours en Vedette*—“Always on the Watch.”

Vega, a star in the constellation Lyra. On account of the motion of the pole of the equator round that of the ecliptic, stars alter their apparent positions in the heavens [PRECESSION], and it has been calculated that in about 12,000 years Vega will be within 5° of the equator's pole.

Vega Carpio, LOPE FELIX DE, dramatist, was born at Madrid, Spain, on November 25th, 1562, and was brought up under his uncle's supervision, his father having died while he was an infant. Almost from his earliest youth he could compose verse, and was a good Latin scholar in his sixth year. He studied at the Jesuit Imperial College in his native city, and then joined the army, seeing service against the Portuguese in the Azores. He next was employed in the household of Don Geronimo Munrique, Bishop of Avila, and took a degree at Alcalá University. Becoming secretary to the Duke of Alva, he married well, but a duel fought soon afterwards led to his banishment to Valencia. His wife dying, he joined the Armada in 1588, and was lucky enough to get back to Spain, where he wrote the epic poem *The Dragonva*, dealing with the last expedition and death of Sir Francis Drake. He began to write for the theatre with success, and poured out innumerable verses on all conceivable subjects. In 1597 he married again, but family troubles and the death of this second wife caused him to enter holy orders, and he became a Franciscan in 1614. The leisure he obtained was devoted to continual writing, with

the result that Lope de Vega Carpio is the most prolific author known to fame. Cervantes called him "The Monster of Literature," and he is said to have written twenty-one million verses. The number of his comedies alone has been estimated at 1,500. It would be quite impossible to give a list of his best works, as it is not decided which are his best, there being no Spaniard even who has read a sufficient number of his works to judge precisely. It is as a dramatist that he is chiefly known, his poems proper, with the exception of a few light and graceful songs and ballads and perhaps *La Dorotea* (1632), which has been described as a "romance in dialogue," being either forgotten or unread. But to him justly belongs the honour of creating Spanish drama in its definitive form—the three act comedy. He died in Madrid on August 27th, 1635.

Vegetable Ivory. [COROZO NUT.]

Vegetable Kingdom, a convenient collective term for all plants, though, since no precise dividing-line can be drawn between the lowest plants and the lowest animals, the more philosophical division of Nature is into organic and inorganic. The classification of plants now very generally adopted is into four sub-kingdoms, which comprise between them some ten classes, as follows:—

PHANEROGAMIA = SPERMATOPHYTES.

Division II. Angiospermia.

- Class 10. Dicotyledones.
- Class 9. Monocotyledones.

Division I. Gymnospermia.

- Class 8. Gymnospermæ

PTERIDOPHYTES.

- Class 7. Lycopodiæ.
- Class 6. Filicinae.
- Class 5. Equisetinae.

BRYOPHYTES.

- Class 4. Musci.
- Class 3. Hepaticæ.

THALLOPHYTES.

- Class 2. Algæ.
- Class 1. Fungi.

Most of these sub-kingdoms and classes, with their principal subdivisions, have been described separately in various volumes of this work. It should be said, however, that botanists still differ much in the classifications they adopt.

Vegetable Marrow (*Cucurbita ovifera succada*), sometimes looked upon as a variety of the common gourd and believed to be of Persian origin, is one of the most valuable esculents. It is a trailing plant with rough, deeply-lobed leaves and egg-shaped, slightly-ribbed fruit. This, though watery—it contains nearly 95 per cent. of water—is more nutritious than cucumber, containing, when in the green unripe condition in which it is eaten, 2 per cent. of sugar and some starch. The vegetable marrow is now extensively cultivated, preferring a rich moist soil. It is largely made into jam, ginger often being added to give it a flavour of preserved ginger. When pickled, somewhat after the fashion of piccalilli, it develops a pleasantly sharp flavour, not unlike a superior gherkin.

Vegetarianism, a system of diet which consists either wholly or mainly of vegetable produce, precluding in all cases animal food which involves loss of life. Vegetarians differ considerably in the strictness of their views. Most of them now admit eggs and milk to a place, whilst a certain extreme section object to all cooked food as unnatural, confining themselves to nuts and fruits. Some of the considerations which induce people to abstain from flesh have no force in the case of fish, but it would be impossible to frame a definition of the term "vegetarian" which would include fish-eaters. The Vegetarian Society was founded at Manchester in 1847. This society and numerous others, both at home and abroad, are now affiliated to the Vegetarian Federal Union, which dates from 1889. These societies have been very energetic in establishing cheap restaurants for working men in London and other large towns. Vegetarians hold an annual international congress. It cannot be denied that their zeal and perseverance have been rewarded to a surprising extent, especially since the medical faculty has repeatedly insisted that the English-speaking community has been addicted to flesh-eating to a culpable degree—that is to say, a tendency to a diseased condition of the blood and tissues is apt to follow excess in meat diet, which is perhaps a notorious characteristic of English people.

Vehmgericht, or FEHMGERICHT, an institution of mediæval Germany, ascribed to Charles the Great, but probably originating in primitive Teutonic usage. Fehm courts (*Vehmgerichte*) were first held in Westphalia towards the close of the 12th century, and it was in that region that they reached their fullest development in the 14th and 15th centuries. In the absence of any efficient public tribunal, the emperors found them a useful organisation for checking the lawlessness of the feudal lords and their retainers. Each court exercised authority within an assigned area, meeting under the presidency of a Freigraf, who was aided by a varying number of assessors called Freischöffen. At the head of the whole organisation was the Archbishop of Cologne as Duke of Westphalia. In process of time the Vehmgericht was perverted from its original purpose and made use of by the petty princes of Germany for their own ends. It became the interest of the emperors to crush the society, and the last tribunal is said to have been that held at Celle in 1568. The courts lingered on, however, till they were finally abolished by Jerome Bonaparte in 1811.

Veins. The structure of a vein somewhat resembles that of an artery. The muscular fibre of veins is, however, less prominent as a constituent of their enveloping coats than is the case in arteries, and the middle coat of a vein is consequently thinner than that of an artery. Certain veins in the body, particularly those which are subject to muscular pressure, possess valves, which have an important influence in determining the direction of the flow of blood through the veins. When the blood leaves the heart by the arteries it is red, but as it circulates

through all the ramifications of the arteries and capillaries it gives off its oxygen to the tissues and takes up instead a large quantity of carbonic acid. This ingredient changes the colour of the blood borne back towards the heart by the veins into dark blue or purple. The carbonic acid is a poison and is finally eliminated when the blood reaches the capillaries of the lungs, being as a matter of fact expired by the lungs in the act of breathing. If therefore the blood—Norman, for choice—on which the aristocracy is supposed to plume itself be blue blood—which is, certainly, the current belief,—then Nature's comment is significant. It is the used-up blood, the blood that has done its work and is filled with impurity, that is blue and fills the veins. The condition in which the veins become inflamed is known as phlebitis, while when they are dilated and swollen they constitute the state called varicose. [BLOOD; CIRCULATION OF THE BLOOD.]

Veins, in mining and geology, are seams of minerals, usually metallic ores, which fill up cracks and fissures in rocks, frequently ramifying and dividing until they become narrow threads and are ultimately lost. Their thickness varies greatly, from a few inches to a few feet, and the value of a metalliferous vein is always largely increased if its thickness enables it to be easily worked. Some veins appear to be masses extruded from within; in other cases they are due to the deposition, in the cracks and fissures, of substances held in solution probably by water under pressure and at a high temperature.

Velazquez, DIEGO RODRIGUEZ DE SILVA Y, "the painter in whose commanding genius," says C. Gasquoine Hartley, in her authoritative work *A Record of Spanish Painting*, "Spanish realism attained its crowning fulfilment," was born in Seville, Spain, on June 5th, 1599. His father, Juan de Silva, belonged to a worthy Portuguese family, while his mother—whose name, in accordance with Spanish custom, descended to her son—was of the old nobility of Seville. Diego was educated at the University of his native city but, his instincts for art being alike undeniable and irrepressible, he entered (1612) the studio of Francisco Herrera the elder, and, a year later, that of Francisco Pacheco, whose daughter Juana he married in 1618. To his earliest period belong both religious and *genre* subjects, such as "The Adoration of the Magi," "Christ in the House of Martha" (in the National Gallery, London), "Old Woman with an Omelet" and "The Water Seller" (at Apsley House). The succession of Philip IV. to the throne in 1621 turned out to have an all-important bearing on the career of Velazquez. However worthless as a king, Philip had a passion for art and could appreciate original work even when conceived on newer and grander lines than what had hitherto obtained. The artist, after some difficulties overcome by the support of Olivarez, a minister whose character also was largely redeemed by his enlightened patronage of art, settled in Madrid in 1623. He at once began to paint the long series of portraits of the monarch which are still the glory of portraiture. His suc-

cesses aroused the jealousy of the Italian artists resident in the capital, but he triumphed over them all by his picture of "The Expulsion of the Moors from Spain"—a subject which had been thrown open to competition,—which unfortunately perished in the fire at the Prado in 1734. In 1628 he produced his vigorous and daring picture of "Los Borrachos" ("The Toppers"), a Greek mythological theme, full of realism and handled from Spanish models as if the characters were Spanish types. Next year he paid his first visit to Italy where "he did not like



PHILIP IV., KING OF SPAIN. (After Velazquez.)

Raphael at all," but found in Venice "the good and beautiful." During his tour he painted "La Fragua de Vulcano" ("Vulcan's Forge"), one of his most virile renderings of the nude. After his return to Spain in 1631 he was mainly occupied till 1643 in executing royal scenes and portraits for the decoration of Buen Retiro and other palaces. To this period are referred his "Crucifixion" and "Christ at the Column" (in the National Gallery, London), "Philip IV. hunting the Wild Boar" (also in the National Gallery), "The Surrender of Breda," the masterly portrait of "Admiral Pulido de Pareja" (in the National Gallery), the portrait of the sculptor "Martinez Montañes," than which even Velazquez

never achieved anything finer, in addition to numerous equestrian portraits of Philip IV., his wife, Olivarez, and the Crown Prince "Don Baltasar in the Riding-School." In 1649 he was despatched to Italy to purchase pictures and statues for the newly rebuilt Alcázar. On this occasion he painted his Moorish slave "Juan de Pareja" and "Pope Innocent X.," both of which more than sustained his reputation. In 1651 he was called back to Madrid to paint the portrait of "Doña Marianna of Austria," Philip's second wife, and next year was appointed Palace Marshal, his duties comprising the arrangement of royal journeys, Court festivities and tournaments. In 1655 he painted "Las Meninas" ("The Maids of Honour") and shortly afterwards "Las Hilanderas" ("The Spinners"), two of his greatest works. To this last period also belongs "The Rokeby Venus" in the National Gallery, London, a picture which was presented to the nation in 1906 by a body of private art patrons who acquired it for £35,000. It would be presumptuous to criticise the perfect technical qualities of this work, but the realistic rendering of the goddess compares unfavourably with the imaginative and more dignified treatment of the same subject by others of the immortals. His last great picture was "The Coronation of the Virgin," the most decorative and most Italian of his works. Velazquez died at Madrid on August 6th, 1660.

Vellum (from the same source as "veal," which is derived from the Latin *vitulus*, "a calf"), the skin of calves prepared for writing, painting, or printing by exposure in a bath of lime and repeated rubbings with a burnisher. Strictly speaking, the word is properly employed only of calf-skin. When other skins are in question the term parchment is applied to them and has in fact practically replaced the word "vellum." The illuminated missals were commonly painted on vellum, which is still largely used for the exhibition of legal documents and the writing of presentation addresses and other memorials. "Vellum post" and "vellum wove" are trade terms descriptive of paper with a highly-finished surface in imitation of the surface of vellum.

Velocity indicates the speed or rate of motion of a moving body. It has, however, become customary in recent years to include the idea of direction in the term "velocity," while that idea is not considered in "speed." Thus a velocity of 30 miles an hour northwards would be considered as different from one of 30 miles an hour to the east, though the speed in both cases is the same. Uniform velocity is measured as the space passed over in the unit of time, and, though we ordinarily speak of a velocity of so many miles per hour, it is more convenient mathematically to consider it as so many feet per second. In dealing with a varying velocity, however, we cannot directly measure it in this simple way. At any moment the velocity of a train may be, say, 10 miles an hour, but it does not follow that the train actually describes 10 miles in one hour; if it is increasing its speed, it will describe more, but what we do mean is that if the train continued for an hour with that velocity it would

then describe 10 miles. Average velocity is given by dividing the total space described in any time by the number of units of time employed. A body possessing simultaneous velocities in different directions moves with a resultant velocity, which is found by an application of the parallelogram of velocities. The reverse action to this is the resolution of a velocity into two or more component velocities, whose combined effects are the same as that of the original. The method for accomplishing this is the same as that described in the article on Resolution of Forces. When a body moves with a varying velocity, the rate of change of velocity is known as the acceleration, and is positive or negative according as it tends to increase or diminish the velocity at any moment. The most common example of a body moving under a constant acceleration is that of a falling body, in which case its velocity increases every second by about 32 feet per second.

Velvet, a silken textile fabric, the pile of which is formed by passing part of the warp-thread over wires so as to make a row of loops which project from the backing, and then drawing a knife along a groove at the top of each wire, after which the latter is withdrawn. If it is desired to produce a loop pile, the cutting process is omitted. The manufacture of velvet is supposed to have been introduced into Europe from the Far East in the 13th or 14th century. Genoa has long been noted for its velvet fabrics, but Lyons and Crefeld are now the chief seats of the industry. [FUSTIAN.]

Velvet, the covering of a growing antler. The antler is composed of dense bone, and as long as it increases in size is covered with warm black skin



HEAD OF RED DEER WITH GROWING ANTLETS COVERED WITH VELVET.

similar to that which covers the knob on the forehead of the deer, from which it sprang. Since this skin is covered with short, fine, closely-set hair, it was designated "velvet." The velvet secretes, says Professor A. H. Garrod, "the bony texture of the antler from its inner surface, just in the same way that the outer covering (periosteum) of any long bone of the body is mainly concerned in the formation of the bone itself. As also, in like manner, if we seriously graze our shins, and scrape off this covering, the bone exposed is very apt to die, so in the deer any mishap to the velvet injures the growth of the antler in the part affected. The animals, therefore, during the time they are 'in velvet' are more than usually careful to protect their cranial appendages, and are inoffensive even to strangers. When the antler-growth has ceased their nature changes. The velvet has performed its

function and dries into a parchment-looking membrane, to get rid of which the deer adopt a very simple method. They rub their antlers against any neighbouring trees, and force them into the soft earth until there is none left and the bare bone, with scarcely any trace of hollow in the middle of it, is completely exposed."

Vendée, a department in the west of France, taking its name from a small river which rises in the Forest of Chantemerle and, after a course of 46 miles, joins the Sèvre-Niortaise. It is bounded on the N. by Loire-Inférieure and Maine-et-Loire, on the E. by Deux-Sèvres, on the S. by Charente-Inférieure and on the W. by the Atlantic. It was constituted in 1790 out of Bas-Poitou. It has an area of 2,690 square miles, mostly level, and divided between the Bocage in the east and centre, the Marais in the west and south to the sea, and the Plaine between the other two. The first is woody and cold, the second marshy and unhealthy, whilst the third is best adapted for agriculture. Wheat, oats, barley, rye, potatoes, beet, hemp, flax, are the principal crops, and, besides grapes, the chief fruits are apples, pears, plums and cherries. The live-stock includes sheep, cattle, horses, mules, asses, pigs and goats. Coal, iron, antimony and lead are mined and the "Vendée diamond" (a species of quartz), china clay, granite, slate, limestone and cement are obtained. Salt is yielded in large quantities from the marshes. The manufactures, of not much importance, comprise textiles, pottery, glass, tiles, paper, leather and boots and shoes, besides shipbuilding, distilling, the canning of provisions and the fisheries, especially sardines and oysters (at Sables d'Olonne). La Roche-sur-Yon (10,965) is the capital. The people are Celtic in race and akin to the Bretons. They are devout Catholics and were much attached to the Bourbon dynasty. The peasantry stoutly maintained the Royalist cause at the time of the Great Revolution, the insurrection which broke out in 1792 not being got under for three years. It was in this warfare that Henri Comte de Larochefoucauld (b. 1772) so greatly distinguished himself. He held his own in several engagements and, though overcome by Westermann in 1793, raised a fresh body of insurgents and was slain in the fight at Nouaillé on March 4th, 1794. His address to his men was pithy and noble—"If I retreat, kill me; if I go on, follow me; if I die, avenge me." Pop. (1901), 441,311.

Vendetta (Italian, from the Latin, *vindicta*, "revenge"; *vindicare*, "to defend oneself"), a blood feud in which the nearest kinsman of a murdered man takes up the quarrel and avenges his death by slaying the murderer, or, in the event of the murderer's escape, by slaying his nearest relative. From being the duty of the nearest, it grew to be incumbent on all relatives, involving families in bitter private feuds among themselves. Such feuds, moreover, at times not only existed between families but between villages and clans: such tribal blood-strife continuing over a number of years. A life for a life has been the unwritten law of mankind, and primitive society all the world over naturally tended to taking the law into its own

hands, and if the slayer escaped it was thought just to execute vengeance on his family or kinsmen. The injury done was held to be more than personal—it was a wrong done to the whole *gens*. In all countries this tracking down of the murderer was always looked upon as the duty of the next of kin, but in some countries the avenger gave up his rights for ample compensation. In Biblical days the "Avenger of Blood" was known as the Goel "redeemer." He was the next of kin and had many duties, among which was that of enforcing the claim of satisfaction for the blood of his murdered kinsman. By the tribal custom it was his sacred duty to avenge the blood of his relative, sometimes by not merely slaying the murderer himself but his whole family, for at this time it was considered that for one of their members the family ought to suffer. Later, however, after the Israelites became less primitive, this vengeance was reduced and it was only permitted that the murderer should be killed. Later still in the Bible a distinction was made between murder and manslaughter and it was for this reason that the Cities of Refuge were built in various parts of Palestine. They were, as their name denoted, cities in which those who had done wrong might take sanctuary, and may be said to be the basis of the Jewish criminal code. Should any man commit a murder, once he was within the gates of one of these Cities of Refuge he was safe from his pursuer and could claim that his case should be heard before an assembly or court who should judge whether he had committed murder or only manslaughter. To prove a case of wilful murder it was necessary for the Goel to produce two witnesses, and should the prisoner be convicted of the crime by his judges, the authorities came from the city or village to which he belonged and carried him from the City of Refuge, if necessary by force, back to his own village where he was handed over to the Goel of the murdered man and his death was more or less in the nature of a public execution. But should the court have found that it was only a case of manslaughter the prisoner was acquitted, but it was essential that he should stay in the City of Refuge to escape the vengeance of the Goel who, could he have caught him outside the bounds of the asylum, would yet have had a right to kill him. Not until the High Priest of the City of Refuge died was the Goel forced to forego his right of vengeance. These asylums, six in number, were scattered throughout the Holy Land and were Hebron, Shechem and Kadesh-Naphtali on the west of Jordan, and Ramoth-Gilead, Golan and Beer on the east. This custom of the Goel seems to have existed down to the time of David when a murderer was tried and sentenced by a court. Among the Romans, the *lex talionis* dealt with cases of murder as with the lesser crimes and a regular standard of punishment was meted out. Among the Anglo-Saxons the custom of avenging the death of a kinsman fell to the lot of the nearest relative, but so elementary was their sense of justice that the murderer was allowed to go free on the payment of a sum of money to the avenger's family which was called *wer-gild* (man-money).

As late as 1470 *wer-gild* was paid to the widow of Lord Lisle who was killed by Lord Berkeley at Nibley Green in Gloucestershire, in a family battle between these two noblemen. In Scotland, clan and family feuds in many cases led, down to mediæval times, to petty wars between the clans. But Vendetta in its strictest sense, as its name denotes, was of Italian origin. It is but a development of that early systematised custom demanding a life for a life which prevailed, as we have seen, in the case of the Jewish Avenger of Blood. Its great centre has always been in Corsica, Sardinia, Sicily and Calabria. Corsica, however, was the country in which it flourished most: there it played an important part in the social life and was regarded as the most sacred family duty. Even to-day it still survives in the island. Between 1770 and 1800 it is said to have reached its zenith when between those dates no fewer than 7,000 Vendetta murders took place. It was the sacred duty of the next of kin to avenge the death, and the wild Corsican nature took but little urging to carry out the task. The law prohibiting the carrying of arms in this State did much towards putting an end to the Vendetta (virtually a relic of barbarism), but on the Act being repealed the institution was once more as much in evidence as ever. More often than not, the blood feud between two families was not only waged between the next of kin but between the two families, for more often than not each branch of the family had a murler to avenge on the other, when the feud was called *vendetta trasversale*. When the Vendetta reached such an acute stage it was usual for mediators termed *parolanti* to intervene and extort from the avenger an oath to forego vengeance. In Corsica not only was it a custom among the poorer classes, but the rich resorted to it, as in the case of Piombo, a wealthy Corsican, who, after having killed most of his neighbour's family, escaped to France and sought shelter of Napoleon in Paris. A development of the Italian Vendetta is the Secret Society of the Mafia, the outrages carried out by whose members from time to time have startled the world. The influx of Italians into the Southern States of the American Union (chiefly Texas) is responsible to some extent for the fact that the Vendetta is in existence there and from time to time blood feuds result, as in the case of the Chief Inspector of Police of New Orleans who was brutally murdered in that city in 1890, having in some way provoked the hostility of the Mafia. In Sardinia, Sicily and Calabria the Vendetta is now an almost extinct custom, but it still flourishes spasmodically among many races, for example, among the Afghans, the Maniotes of Greece, the Druses, the Albanians and the Bedouins. A very similar custom is found among the old Scottish-Irish stock inhabiting the mountainous districts of Tennessee, Eastern Kentucky and Western Virginia, whilst among the savage races a Vendetta is still the rule. The privilege of private war between families in Scotland survived to within comparatively recent times, and the Irish outrages committed by tenants on landlords in the 'eighties of the 19th century were much akin to the Vendetta. After a murder had been perpetrated it

was quite usual for the next of kin or one of the family of the murdered to take revenge on the slayer. The Vendetta is of interest as being the foundation of all justice. As society became more complex these primitive blood feuds were found impossible and a systematised administration of justice was evolved.

Veneer (a corrupted form from the French *fournir* and the Italian *fornire*, "to furnish"), a thin slice of some costly wood which is glued to the surface of wood of a commoner kind, such as deal or pine. Articles of furniture which have been veneered appear to be made entirely of the more valuable material. (Hence arises the use of the word figuratively to imply a merely superficial polish or meretricious disguise.) The woods usually chosen are those of a hard consistency to which glue readily adheres, such as mahogany, rosewood and the American yellow pine. Ivory may also be treated in the same manner.

Veneridæ, a family of Lamellibranchs or bivalve mollusca of which Venus is the type-genus; this is found from the Jurassic to the present time, and has a world-wide distribution. Venus is met with buried a few inches deep in sand at low water, ranges to 100 fathoms and is edible. The North American Indians used to make their coinage ("wampum") of sea-worn fragments of Venus mercenaria by stringing them on thin strips of leather. The family includes some of the most beautifully-coloured and most specialised of the Lamellibranchs. Artemis, Cytherea and Thetis are well-known genera belonging to the family.

Venesection. [BLEEDING.]

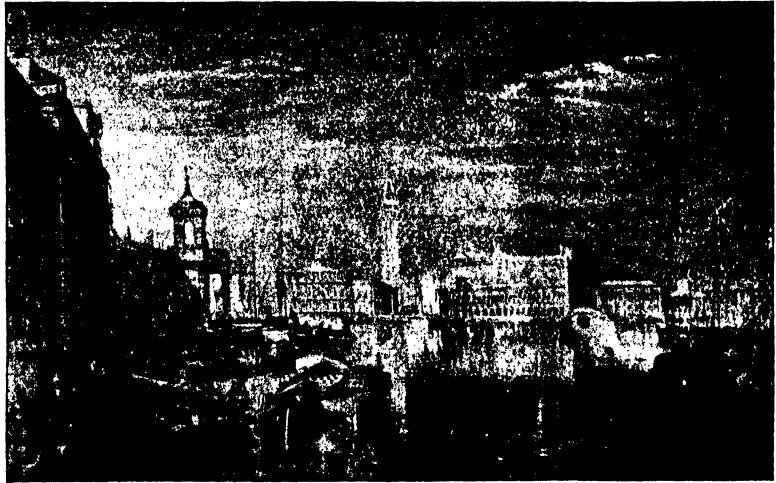
Venetian Red, a pigment consisting chiefly of the peroxide of iron. The natural product is a highly ferruginous earth, which was obtained from the neighbourhood of Venice; but pigments known as Venetian red generally are poorer varieties of rouge obtained by heating coppers or sulphate of iron, and consisting almost solely of the ferric oxide Fe_2O_3 . It is a useful pigment, as it possesses a bright colour, is not poisonous and is very permanent.

Venetian White, a pigment which consists of a mixture of heavy spar (barium sulphate) with white lead. It possesses, however, the disadvantage of the latter substance, being poisonous, and being turned black when exposed to fumes of sulphuretted hydrogen.

Venezuela ("Little Venice"). a group of thirteen states, five territories and the Federal District, in the extreme north of the South American continent, forming a republic which is sometimes styled the United States of Venezuela. Columbus in 1498 and Ojeda and Vespucci in 1499 reached the coast, and Spanish occupation began early in the 16th century. In 1810 a concerted effort was made to throw off the Spanish yoke, and the people proclaimed their independence next year. In 1813 Bolivar, the patriot, led the inhabitants, who hailed him as the Liberator. Six years later Venezuela and New Granada

formed the republic of Colombia, and in 1830 Venezuela was constituted an independent republic. Legislative authority is vested in the Senate and Chamber of Deputies, while the executive power is entrusted to a President (elected for six years and not eligible for the following term) and a cabinet. The peaceful development of the country was hampered for a period by the sordid ambitions and petty jealousies of adventurers aiming at concentrating all power in their own hands, and in 1895 a difference with Great Britain over the boundary line between British Guiana and Venezuela nearly precipitated a serious misunderstanding with the United States, the protection of which had been adroitly invoked in the event of the United Kingdom demanding an indemnity. President Cleveland was sufficiently headstrong to regard any armed encroachment on Venezuelan territory as a breach of the Monroe Doctrine—a claim to the control of all America which created a temporary sensation. Better counsels prevailed, and the question was referred to arbitration in 1897. On the 3rd of October, 1899, the arbitrators issued their decision, but long ere this the heat and passion that disturbed the New World had cooled. Venezuela has an area of about 364,000 square miles, being bounded on the E. by British Guiana, on the W. by Colombia, on the N. by the Caribbean Sea and the Atlantic, and on the S. by Brazil. The Eastern Cordilleras, rising to 15,000 feet, traverse the country to the north, and below this the vast plain of the Orinoco stretches southwards. Large lakes fringe the coast, such as Lakes Maracaibo and Valencia, and many islands—Tortuga and Valencia the chief—are included in its territories. The soil is extremely fertile, yielding cacao, coffee, sugar, indigo, cotton, dye-woods, cinchona, fustic and drugs. Cattle are abundant, and hides are largely exported. There are immense mineral resources, gold, silver, copper, iron, lead, tin, coal, salt, petroleum and asphalt all occurring in various parts, but mostly calling for capital and capacity for their exploitation. Pearl fishing is carried on round the island of Margarita and adjoining islets. As yet manufacturing enterprise is in its infancy. The Roman Catholic is the state religion, but others are tolerated. Elementary education is free and compulsory. Caracas (72,429) is the capital. Pop. (1905), 2,602,492.

Venice (Italian, VENEZIA), the capital of the province which bears its name at the head of the Adriatic Sea, Italy, 155 miles E. of Milan. From the Adriatic it is protected by the island of Lido, a natural breakwater and favourite bathing-ground of the inhabitants. Within this lies a shallow lagoon—little better than a mud waste at low tide—dotted with eighty islets, upon which the city is built, wooden piles serving as foundations, and canals, navigated by gondolas and steam and motor launches, taking the place of streets. The Veneti were established here in the 4th century B.C., and became subject to Rome two hundred years later. It was not, however, until A.D. 432 that the present city sprang up. In 697 the settlers, having formed a quasi-political union, elected a doge or duke as chief magistrate. In 809 the community made



VENICE.

(From the painting by J. M. W. Turner in the National Gallery, London.)

itself into a republic. In the 10th century began an era of expansion and conquest. Dalmatia, Istria, the Morea, Corfu, Cephalonia, Crete, Cyprus and many other acquisitions were made. In the 14th century she was at the height of her glory, having finally succeeded in ousting Genoa from the maritime supremacy of the inland sea. All the overland trade with India and the East was practically monopolised by the merchant princes of Venice. The discovery of the Cape route to the East and of the American continent checked and finally extinguished her prosperity. Little by little her conquests were wrested from her, chiefly in the 17th century by the Turks, and in 1797 Napoleon Bonaparte seized her territories and, giving part to Austria, incorporated the rest with the Cisalpine Republic, and the line of doges then ended with Luigi Manin. The Peace of 1814 transferred the whole to Austria, and for fifty years the Queen of the Adriatic had to submit to a foreign yoke. In 1866, by the intervention of France, Venice was

finally annexed to the kingdom of Italy. The city has since then recovered some of its former prosperity. It is the headquarters of the Peninsular and Oriental Company in the Mediterranean, and of other great lines of steamers. The port has been improved, and the foreign trade is reviving. The Grand Canal, traversing the city from north-west to south-east, is bordered by magnificent marble palaces, such as the Camerlenghi, Giustiniani, Foscari, Pisani and Casa D'Oro. The quaint bridge of the Rialto spans it, leading to the island which was the nucleus of the early state. On one side of the Piazza San Marco stands the Byzantine Church of St. Mark, founded in 977, yielding in its wealth of adornment to no sacred edifice in Europe. The brick campanile which used to stand in front collapsed on July 14th, 1902, but was rebuilt. From the Piazza opens out the Piazzetta, having on the east the palace of the doge. Opposite is placed the royal palace. The doge's palace is connected at the back with the Piombi, once the state prison, by the famous Bridge of Sighs. Across the water are the domes of San Giorgio Maggiore and Santa Maria della Salute, and of the other churches may be mentioned La Madonna dell' Orto, SS. Giovanni e Paolo, San Salvatore, the Redentore and Santa Francesco della Vigna. The library in the Palazzo San Marco is one of the most valuable in Europe, and there are a large arsenal, a dockyard and numerous public institutions. The Venetian school of art claims some of the greatest of the masters, of whom it will suffice to name Titian, Tintoretto, the Bellinis, Giorgione and Paolo Veronese. The manufactures are chiefly artistic—*e.g.*, brocaded stuffs, lace and velvets, jewellery, mirrors, iron and bronze-work and imitations of the antique—but shipbuilding, printing, the making of soap, candles, sugar and confectionery are carried on. A railway viaduct, more than 2 miles long, connects Venice with the mainland. Great and successful efforts have been made to revive the old glass industry, of which the island of Murano is the principal centre, and beautiful specimens of coloured ware are now produced. Pop. (1901), 151,842.

Ventilation. As the continued respiration of persons vitiates the surrounding atmosphere, it becomes necessary in enclosed rooms to make provision for the renewal and constant change of the air, so that the impurity shall not extend beyond a limit prejudicial to health. This renewal of the air is known as ventilation, and it is remarkable and lamentable that, although in most dwelling-houses provision is always made for the warming and lighting of rooms, scarcely ever is any adequate provision made for the equally important ventilation. The amount of fresh air required per individual per hour may be found by a simple estimation. The atmosphere contains about four parts of carbonic acid per 10,000. Expired air, however, contains a higher and almost constant percentage. The quantity of carbonic acid may therefore be employed as an index of the impurity of the air. For hospitals, etc., the quantity of this gas should not reach above six parts per 10,000, which may be taken as the limit, and, as each

person expires about 6 cubic feet of carbonic acid per hour, he vitiates to the limit of permissible impurity 3,000 cubic feet of air; and this amount of fresh air should therefore be supplied per individual per hour. Gas-burners, lamps, etc., further pollute the air, and at night-time allowance must be further made for these. It follows from the above estimate that the air of a small room requires complete change more frequently than that of a larger one and hence with adequate air-supply is more liable to draughts, and owing to this large rooms are preferable from the hygienic standpoint, especially in hospitals, schools and charitable institutions. Ventilation may be effected either by natural or artificial agencies. Natural ventilation is based upon the fact that hot air is lighter than cold, and hence ascends, while also the air vitiated by breathing or illuminating agents is always warmer than the atmosphere. Hence, if apertures be made at the tops of rooms the impure air escapes, and pure air may be drawn in from below. This, however, has the disadvantage of invariably producing draughts and, though provision for the exit of air is well made at the tops of rooms, as by tubes above the gas-burners, valves opening into the chimney, etc., the entering air should not enter too low, but at a moderate height in the room, and should be given an upward direction, that it may slowly diffuse downward and not fall as a cascade of cold air upon the heads of the occupants. This is effected by various forms of ventilators, one of the best-known being Tobin's tubes, much used in large rooms. They consist of tubes opening to the exterior air at the level of the floor and rising upwards in the room to a height of three or four feet. A very simple and effective means of providing for the influx of air in ordinary rooms, bedrooms, etc., is by raising the lower window a few inches and supporting it upon a block of wood extending right across; air thus enters in an upward direction between the sashes and glass. Where no provision is made for the exit of the air, the chief agency causing ventilation is the fire, by means of which a continual current of air is kept passing up the chimney, which draws into it the air from all over the room. Even when no fire is burning, the fireplace should not be completely closed, as it forms an invaluable aperture for the exit or entrance of air. In large warehouses, workshops, etc., artificial agencies may be employed to produce currents of air. Of these the most common are various forms of turbines or fans, by which a continuous stream of air may be kept up. They are also exceptionally useful for coal-mines and in workshops where the air is charged with small particles either of organic or inorganic matter. Speaking generally, there is far too much intolerance of fresh air in most families. The bedroom windows should always be lowered, day and night, summer and winter, to a space of several inches, varying with the season, but in midwinter never fewer than 6 inches. Vehicles are commonly supposed to be ventilated whilst in motion and, while this may be true of express trains travelling at full speed, it is astonishing what a stuffy and unwholesome atmosphere people breathe when riding on local and suburban

railways. To penalise expectoration and leave ventilation untouched is to strain at the gnat and swallow the camel.

Ventnor, a watering-place on the south-east coast of the Isle of Wight, England, 10 miles S. by W. of Ryde. Owing to its balmy climate and comparative freedom from rain it has a high reputation as a health resort, especially for all who suffer from pulmonary complaints. The town rises in terraces from the sea and is protected from the north wind by St. Boniface Downs, nearly 800 feet in height. There are beautiful walks in the Undercliff—a picturesque tract, formed by land-slips, which extends by the sea some three miles to each side of the town—towards Shanklin eastwards and Blackgang Chine westwards. Ventnor is almost wholly modern, dating roughly from the accession of Queen Victoria (1837). The chief buildings are the churches of St. Catherine and Holy Trinity, both in Early English; the Literary and Scientific Institute; the Albert Hall; the Assembly Rooms; the Royal National Hospital for Consumptives and several convalescent and charitable institutions. Pop. (1901), 5,866.

Ventriculites, the members of a family of Sponges found in the Chalk. They belong to the group of Hexactinellida, and are therefore composed of silicious material. Most of the Ventriculites have cup-shaped, cylindrical, or funnel-shaped bodies, and are fixed by radiating roots. They are clearly defined by the six-rayed form of their spicules. They are commonly found in flints.

Ventriloquism, the art of speaking in such a manner that the sounds seem to proceed not from the speaker but from some other direction. The name arose from the erroneous notion that the voice was projected from the stomach. The sounds are produced by means of the muscles of the pharynx and larynx, but the result largely depends upon the performer's dexterity quite as much as upon ability to modify the organs of speech. A comical dummy figure is commonly employed, ostensibly to do most of the ventriloquial talk, really to withdraw the hearer's attention from the performer, who has sometimes to display his powers at very close quarters.

Venue, the country in which an action is intended to be tried, and from which the jurors are to be summoned. The plaintiff has the right to determine this, subject to rules, and, when fixed upon and determined, it is termed "laying the venue." The venue is, however, liable to be changed on good cause therefor being shown. Originally a case was tried by jury in the vicinity of the place where the cause, whatever it was, arose. But now, save when otherwise provided for by statute, there is no local venue for the trial of any action. Though the plaintiff may name the place of trial, this may be changed at the discretion of the court or a judge.

Venus appears to us as the most brilliant of all the planets, sometimes heralding the sun's approach in the morning and sometimes following him at night. Hence she has been called the "morning"

and the "evening" star; and the ancient Greeks, believing her to be two bodies, and not one, called her Hesperus (Vesper) when she appeared at night, but Phosphorus when she preceded the dawn, this last name having been translated in the Latin Lucifer. But Copernicus explained this double function in the same way as he cleared away the curious errors regarding the motions of other celestial bodies. Venus was a planet, his theory stated, moving round the sun, and nearer to the latter than the earth by nearly twenty-six million miles. She thus appears to us to cross alternately in front of the sun and pass behind him, never reaching a distance more than $47^{\circ} 12'$ away from him. This maximum distance on either side of the sun is known as her eastern or western elongation, according to which side of the sun she appears, it being eastern when she shines as the evening star. When she passes between us and the sun—i.e., at inferior conjunction—she is quite dark on the face nearest to us, and is therefore invisible. When she is behind the sun—i.e., at superior conjunction—she has her bright face to us, and would be seen in full daylight but that her little light is completely masked by the sun's brilliancy. After this conjunction she gets more to the east of him every day, and therefore follows him as he sets. The limit is reached when she attains her elongation of about 47° , and, since the earth turns round 45° in three hours, Venus remains in view for about that time after sunset. Then the time of her visibility gets less and less as the evenings pass by, till she is lost to view, after which she comes to the west of the sun, and so shines in the morning. The time during which she is visible now increases more and more, till again she may be seen for about three hours before sunrise, after which it lessens till she reaches superior conjunction. The time taken to go through all these changes—her synodic period—is about 584 days. Since Venus shines only with light reflected from the sun, and since her orbit is within that of the earth, we should expect her to exhibit phases like the moon, and the fact that she did so was first noticed by Galileo. The moon is brightest when full, and the earth is then between the sun and moon; but Venus, when full, is beyond the sun from us, and so is completely obscured by him. She appears brightest when she is nearly in a line between us and the sun before her crescent vanishes. On account of a sort of haze which envelops this planet, astronomers have been unable accurately to determine her period of rotation on her axis. For over two hundred years they were led to attribute to her a day only a few minutes shorter than ours, but since the observations of Schiaparelli in 1890 it has been considered more probable that her period of rotation is something like 230 days. Since she takes about 224½ days to complete her circuit round the sun, it follows that she must turn nearly the same face to him always, resembling the moon in her behaviour to us. If this be the case, her one half enjoys perpetual day while the other freezes in continuous night. We know very little of the actual surface of Venus, for her envelope of clouds remains constantly in front of us to baffle curiosity, and

never lifts to give us a glimpse of the planet beneath. These clouds send on to us the light they borrow from the sun, and shine to us with a brilliant silvery lustre interrupted here and there with shadowy markings of short duration. But when Venus shines to us in crescent-form, certain spots near the ends of the horns can be seen more definitely, and the effects of light and shadow round these points suggest that they are lofty peaks, reaching forty miles or more above the clouds. Many observations in early years seemed to indicate that Venus had a satellite or attendant moon, but the most delicate instruments of modern days have failed to produce the faintest glimpse of one, even when she is traversing the disc of the sun; so that for this and mathematical reasons the old appearances of a satellite are considered to have been illusions or else a faint star in proximity to the planet was mistaken for an attendant. [SUN.]

Venus, the goddess of love and beauty, daughter of Zeus and Dione, one of the Titans, was primarily goddess of the spring among the Romans, but became identified later with the Greek Aphrodite (meaning "foam-born"), and is pictured rising from the sea. Her passion for Adonis and her amours with Anchises and Ares (Mars) are incidents in the legends concerning her. Until her identification with the Greek goddess she was held of little account and ranked with the lesser divinities. The Romans ultimately established her worship because, in consequence of her amour with Mars, they inferred she might have been concerned in the origin of their race. Though no day was specially dedicated to her, April was associated with her and the 23rd day of the month was assigned to her in a festival of a low class. Cyprus was generally considered the home of her worship. Her proverbial beauty has been the theme of countless artists, sculptors and poets of all countries and ages. The statue of Venus found in the island of Milo, in the Ægean Sea, is probably the most beautiful figure in the world, and is now the gem of the Louvre.

Venus's Ear-Shell (*Haliotis*), a gasteropodous mollusc found in the littoral zone in temperate and tropical waters. The shell is striated and ear-shaped, with a small flat apex and a very wide iridescent aperture. One species is very common on the shores of the Channel Islands, where the animal is cooked and eaten, after being well beaten (just as if it were a beefsteak) to make it tender, and the shell is in favour as an ornament of the mantelpiece. The shell is much used in the East and elsewhere for inlaying *papier-mâché* work. Any pearly shell, seen in section, displays a succession of fine layers. If worn or polished ever so little, these laminae will be cut through and their edges present a series of parallel lines. In the nacreous Ear-shell the layers are corrugated, so that even a single layer may produce a pearly effect. *Haliotis* is an article of diet in Japan.

Venus's Flower-Basket, a glass-sponge of the genus *Euplectella*, generally the species *E. aspergillum*. It has a framework "so exquisitely beautiful in its fairy-like tracery," says Professor

W. J. Sollas, "as to have called forth the remark from a distinguished naturalist 'This passes the love of woman.'" It is often seen as an ornament under a glass shade.



VENUS'S FLOWER-BASKET.

The spicules cross one another in such a way as to "weave together a thin-walled vase of delicate lattice-work with square meshes." When it frequents the deep-sea mud it terminates below in a tuft of anchoring spicules, but in shallow water on a hard bottom it becomes attached and these spicules gradually atrophy.

Venus's Fly-Trap. [DIONEÆ MUSCIPULA.]

Vera Cruz, a state of the Mexican Republic, bounded on the N. by Tamaulipas, on the W. by San Luis Potosi, Hidalgo and Puebla, on the S. by Oaxaca, on the S.E. by Chiapas and Tabasco, and on the E. by the Gulf of Mexico. It occupies an area of 29,201 square miles. It has a long sandy seaboard, where the climate is unhealthy, but about thirty miles from the sea the land rises rapidly and becomes very mountainous, the volcano of Orizaba reaching a height of over 17,000 feet. The soil yields coffee, cotton, sugar, tobacco, vanilla, cocoa, wheat, maize, dye-woods, rubber and all kinds of tropical produce, and on the higher levels may be found every variety of climate. Yellow fever prevails on the coast. Jalapa (20,388), from which the drug jalap derives its name, is the capital, and among other towns are Tuxpan (5,455), Cordoba (7,974), and Vera Cruz. Pop. of state (1900), 981,030. The town of VERA CRUZ (29,164) is a port 195 miles E. by S. of the city of Mexico, the entrance being covered by the island of San Juan de Ulua and protected by a strong fortress. Ores, cochineal, indigo, dye-woods, drugs, etc., are largely exported, the manufactures of Europe and America being received for distribution in the interior. The manufactures comprise textiles, tobacco, pottery, iron and liquors.

Veratrum, the False or White Hellebore, a genus of plants of the order Liliaceæ, containing nine species, of which four are native to Europe and Siberia and five to North America. The purple, green, or white flowers are numerous and the roots very poisonous, the root-fibres also possessing poisonous properties. They are used medicinally, their action being emetic and cathartic. Gardeners employ a powder of *Veratrum album* (the European lingwort or sneezewort) to destroy caterpillars, although slugs and snails eat the fresh leaves with impunity. *Veratrum viride* (the American Indian poke or itchweed) was used by the Indians as an emetic and furnishes a preparation variously employed as a cardiac and in fevers as a sedative. When grown in gardens care should be had to distinguish them, because of

their noxious qualities, from the harmless gentian (*Gentiana lutea*), the foliage of both plants being somewhat alike.

Verbena, a small genus of herbaceous and shrubby plants, mostly natives of America, though represented by one British species, the vervain (*V. officinalis*), which gives its name to the small gamopetalous order Verbenaceæ. They have opposite exstipulate leaves; bracteate inflorescences; monosymmetric, pentamerous, and often bilabiate flowers; included didymous stamens; and two carpels forming a four-chambered, four-seeded ovary with a terminal style. They thus differ mainly from the Labiata in the style not being gynobasic. The teak belongs to this order. Several American species are cultivated for their gay flowers. The lemon-plant or sweet-scented verbenas of gardens, with its fragrant foliage, is the allied *Aloysia citrodora*, and the volatile oil known from its perfume as oil of verbenas is the produce of the Indian grass *Andropogon citratus*.

Verboeckhoven, EUGÈNE JOSEPH, painter, was born at Warneton, Belgium, on June 8th, 1798. His father Barthélemy, a sculptor, taught him drawing and modelling, and when he confined himself to painting he still kept up the practice of modelling animals in clay, a custom that gave great accuracy to his drawing of animals. His leading pictures, chiefly horses, cattle, sheep and dogs in landscapes, are characterised by a fine sense of composition and colour, and are rapidly enhancing in value in the auction-room. He died in Brussels (where he had finally settled in 1847) on January 19th, 1881. His works are not seen in many galleries, as they were largely secured by collectors in the United States. He was an etcher and lithographer of very considerable skill.

Verdi, GIUSEPPE FORTUNINO FRANCESCO, composer, was born at Roncole, near Busseto, Italy, on October 9th, 1813, and, studying music under good teachers, produced his first opera, *Oberto Conte di San Bonifacio*, in 1839 at La Scala, Milan. It was fairly well received and he was encouraged to persevere. In 1842 his *Nabuccodonosor*, in 1843 his *I Lombardi*, and in 1844 his *Ernani*, appeared, and Verdi was henceforth one of the most popular of composers. His *Attila* (1846) and *Macbeth* (1847) did not add much to his fame, but *Rigoletto*, which, like *Ernani*, was founded on Victor Hugo's *Le Roi s'amuse* and was produced in 1851, was tremendously successful, a success enhanced by *Il Trovatore* and *La Traviata*, both appearing in



VERDI.

(Photo: Benque, Paris.)

1853. (In the first performance of the latter in Paris in 1864 Christine Nilsson made her *début* on the operatic stage.) Few operas are more popular than these. *Un Ballo in Maschera* (1858), *Aida* (1871), *Otello* (1887), and *Falstaff* (1893) strengthened the claim of Verdi as the greatest of Italian operatic composers. It is noteworthy that the work of his old age was musically riper and on a higher plane than the tuneful work that gained him his reputation. Writing so diligently for the stage small time was spared him for other works, but his *Requiem* (1874), in commemoration of the death of Alessandro Manzoni (1785-1873), and his *Ace Maria, Laudi alla Vergine, Stabat Mater and Te Deum* (the four produced in 1898) enhance rather than detract from the solidity of his position as one of the grand masters of music. He died in Milan on January 27th, 1901.

Verdigris consists chemically of a mixture of basic cupric acetates of variable composition, which may be approximately represented by the formula $C_2H_3O_2 \cdot CuOH$, and is prepared by exposing copper strips in air to the action of crude acetic acid. It has a fine green colour, and is employed to some extent as a pigment, though its use is open to objection, as the compound is decidedly poisonous. It is also used, though to a small extent, for external applications in pharmaceutical preparations.

Vere, SIR FRANCIS, general, was born probably at Crepping Hall, Essex, England, in 1560. He entered the army on reaching manhood, and was sent to Holland with the Earl of Leicester's expedition in 1585, and fought bravely throughout the campaign. For his gallant defence of the water-fort in the siege of Bergen-op-Zoom (1588) he was knighted. In the following year he was promoted Sergeant-Major-General in command of all Elizabeth's soldiers out of the garrisons in the Low Countries. His operations against the Spaniards, though not uniformly successful, were always characterised by great brilliancy and thoroughness. In 1596 he took part in the expedition to Cadiz, but was in Holland again in the following year. His bravery at the battle of Newport (July 2nd, 1600) was his crowning achievement, although the defence of Ostend from July 5th, 1601, till March 7th, 1602, one of the most notable exploits in English history, was of greater moment to the Dutch cause. With the accession of James I. peace came to the Spaniards. In 1606 Vere was appointed Governor of Portsmouth. He died in London on August 28th, 1609. In his *Commentaries*, not published till 1657, he gave a business-like account of "the diverse pieces of service wherein he had command."

Verestchagin, VASIL (BASIL), painter, was born at Liubets in the government of Novgorod, Russia, on October 26th, 1842. As a lad he entered the navy, which he left in 1860 to devote himself to art. He studied first at the Academy of Fine Arts in St. Petersburg and afterwards at the *École des Beaux Arts* in Paris under Gérôme. In 1866 he exhibited at the Salon "The Dukhobors chanting the Psalms" and next year accompanied

General Kaufmann in his expedition to Turkestan, which furnished him with several subjects both of warfare and of ethnography. A sojourn in India yielded a number of pictures, of which the most noted was "Sepoys Blown from the Guns." The Russo-Turkish war enabled him to see the bloodiest side of international strife and the gruesome and horrible filled many canvases. After a tour in the Holy Land (1884) he produced a "Holy Family" and other sacred subjects, but returned to fighting in 1893, when he painted the series illustrating the discomfiture of Napoleon in the Moscow campaign. The Russo-Japanese War took him to the Far East in 1904, where he painted "Admiral Alexeieff reviewing the Troops at Port Arthur" and (his last picture) "Admiral Makaroff in Council with his Officers." He went down with Makaroff in the *Petrovsk* on April 13th, 1904. His draughtsmanship was good, his colour crude and his technique poor.

Vergniaud, PIERRE VICTURNIEN, orator and Revolutionary, was born at Limoges on May 31st, 1753, and educated at the Jesuits' College in Limoges and the College of Plessis in Paris. He was called to the Bar in 1782, but was too much of a dreamer energetically to follow his calling. Chosen a member of the General Council of the Gironde in 1789, he drew a picture of the hard life of the poor, informed with such sympathy, carrying such conviction, and inspired by such eloquence, that his fame as an orator spread throughout France. Elected in 1791 to the Legislative Assembly as representative of the Gironde, he won universal attention in Paris as a speaker. He sided sincerely with the Republican party, but had not the courage to denounce the authors of the infamous massacres of September. In his projected Address to the People (December 27th, 1791) and his Call to Arms (January 18th, 1792), he moulded the destinies of his country. His ideas were lofty and he would have moved forwards on constitutional lines, but he was powerless to stay the mad tumult of the populace and, himself honest, to counteract the schemes of the extremists who used him as a tool and catspaw. On July 3rd he had denounced the king, and within a month he realised whither the great agitation was tending. Then he tried to arrest the excesses of the mob. His denunciation of the massacres, however, gained for him and the Girondists the hatred and opposition of Robespierre and his followers. On December 31st, 1792, he spoke in favour of an appeal to the people on the subject of the fate of Louis XVI. It was one of his grandest efforts, but when, on January 16th, 1793, a vote was taken touching the punishment of the king, Vergniaud voted for death, and next day discharged the painful duty of announcing the decision. When Robespierre proposed the establishment of the Revolutionary Tribunal, Vergniaud, at last roused to action, denounced it. This sealed his own doom. Twenty-two Girondists, himself included, were tried before the Tribunal on October 27th, and on October 31st, 1793, they were guillotined in Paris, the company singing the Marseillaise as they went to the scaffold. Vergniaud

was the last to suffer. On the walls of the chamber of the Carmelite convent to which the prisoners had been consigned temporarily, he wrote in letters of blood, "Potius mori quam foedari" ("Death rather than Defilement").

Verlaine, PAUL MARIE, poet, was born at Metz, which then belonged to France, on March 30th, 1844. He soon gave evidence of his lyric gifts, his earlier works comprising *Poèmes Saturniens* (1866), *Les Fêtes Galantes* (1869), and *La bonne Chanson* (1870). This period of activity yielded to a decade strangely compounded of Bohemianism, imprisonment at Mons, trips to London and resistance, sometimes passive, sometimes active, to convention. His experiences coloured *Sagesse* (1881), which preluded renewed productiveness, amongst his later books being *Jadis et Naguère* (1885), *Romances sans Paroles* (1887), *Amour* (1888), *Parallèlement* (1889), *Dédicace* (1890), *Bonheur* (1891), and *Confessions* (1895). For a while he was teacher of French and drawing in London, and afterwards taught in the College at Rethel and at Boulogne-sur-Seine. His ruined health gave way in 1889, and he passed the rest of his days the inmate of one hospital after another. He died in Paris, almost alone and friendless, on January 8th, 1896. A wayward, headstrong genius, Verlaine was a master of the poetic art and ranks with the greatest French poets of the 19th century.

Vermes, the name of the group of animals including all the worms. Its value as a distinct group is doubtful, as it does not form a definite phylum like the Molluscs or Arthropods. It consists of thirteen classes, several of which are isolated from all the others, and no simple general diagnosis can be drawn up to include them all. Reference must therefore be made to the separate classes. These are as follows:—

1. Enteropneusta, including Balanoglossus which has certain affinities to the Chordata.
2. Chaetopoda, the bristle-bearing worms, such as the Sea-mouse (Aphrodite) and the Earth-worm (Lumbricus).
3. Archi-Annelida, including some primitive forms allied to the Chaetopoda.
4. Gephyrea, including the Spoon-worms (Sipunculus).
5. Hirudinea, the Leeches.
6. Rotifera, the Wheel-animals.
7. Nemertea, the Ribbon-worms.
8. Trematoda, the Flukes.
9. Cestoda, the Tape-worms.
10. Turbellaria, the Planarians.
11. Chaetognatha, comprising the small pelagic Sagitta.
12. Nematoda, including the Vinegar-eels, Round-worms, Guinea-worms, etc.
13. Acanthocephala, comprising the genus Echinorhynchus, of which the adult is parasitic in the alimentary canal of some Vertebrates.

Vermetidae, a family of Gasteropoda, or univalve mollusca, of interest from the resemblance of the shell to many worm-tubes, such as Serpula. So marked is this that with fossil forms it is often

difficult to know whether to assign them to the molluscs or worms. The type-genus is *Vermetus*, the Worm-shell, which dates from the Carboniferous period onwards. The young shell in *Vermetus* is regularly spiral, becoming tubular and irregular as it grows older. The members of the family are all marine, being found on the coasts of Portugal, the Mediterranean, Africa and India.

Vermiformia, a group of the animal kingdom which includes only the genus *Phoronis*, and is allied to, or a member of, the class of Bryozoa. *Phoronis* is a small worm-like animal, which inhabits a long leathery tube. They occur in colonies and are found around the English coasts.

Vermifuge. [ANTHELMINTICS.]

Vermilion, a valuable pigment with a fine bright red colour, which consists chemically of mercury sulphide, and may be obtained from the naturally-occurring compound, the well-known ore cinnabar. It is usually prepared artificially; but, as the sulphide of mercury obtained by trituration of mercury and sulphur or by the precipitation of mercuric salts is of a black colour, it has to be further treated. The best vermilion is obtained by thoroughly trituring mercury with flowers of sulphur and then heating the mass under a strong solution of potash until the desired bright tint is obtained, when the potash solution must be immediately washed off. Vermilion is frequently adulterated with red-lead, and is used largely as a pigment both for oils and water-colours, in the preparation of various red printing and other inks, for sealing-wax, etc.

Vermont, one of the New England States of the American Union, bounded on the N. by Quebec, on the E. by New Hampshire, on the S. by Massachusetts, and on the W. by New York. The Connecticut, on the east, and Lake Champlain, on the greater part of the west, are natural boundaries. It covers an area of 9,565 square miles. On either side of the Green Mountains—of which Mount Mansfield (4,430 feet) is the highest point—which traverse it from north to south, extend large tracts of pastoral and arable land, yielding wheat, oats, maize, hay, potatoes, maple-sugar, tobacco and very fine hard fruits. Dairy-farming is of great importance and live-stock, especially sheep and cattle, are extensively raised. Timber is plentiful, and iron, silver, lead, copper, manganese, marble—of which no other State produces such a variety and quantity—soapstone, slate and potter's clay are worked. The Connecticut, with its affluents, drains the eastern portion, the chief rivers to the west being the Winooski, Otter, Lamoille and Missisquoi, falling into Lake Champlain. There are many small lakes. The manufactures comprise textiles, leather, agricultural implements, flour, tin and copper ware, furniture and lumber products. Montpelier (6,266) is the capital. Vermont first became known in 1609, when Champlain explored the lake named after him. Both New York and New Hampshire, about the Revolutionary period, asserted jurisdiction over the territory, despite the wishes of the settlers who, their claim to join the Union being refused,

in 1777 announced their independence and set up a constitution of their own. In 1791, however, they were admitted as the fourteenth State (or the first, not reckoning the thirteen founder States). Pop. (1900), 343,641.

Vernation (from the Latin *ver*, "spring"), sometimes also known as **PREFOLIATION**, is the arrangement, folding and rolling of foliage-leaves in the bud stage. In this two points have to be noted—the arrangement of the individual leaves, and that of the leaves with reference to one another. Individually the leaves may be plane, or flat, as in firs; reclinate, or folded with the apex towards the base, as in the rare case of the tulip-tree; conduplicate, or folded down the midrib, the two halves together, like a sheet of note-paper, as in the oak or cherry; plicate, or folded like a fan, as in the beech and sycamore; circinate, or rolled from apex to base, like a bishop's crook, as in ferns; convolute, or rolled up from side to side, like a scroll, with one margin free, as in plums, arrowroot, etc.; involute, with the margins rolled upwards towards the upper or ventral surface, as in butterwort and violets; or revolute, with the margins rolled back towards the under (dorsal) surface, as in rhododendron, docks, etc. Collectively the leaves may be valvate, touching at their edges without overlapping, like swing-doors; imbricate, overlapping like roofing-tiles, as in poplars; equitant, where each leaf is conduplicate and overlaps with its edges those of the next in succession, as if astride of it, as in the iris; or half-equitant, where each leaf is, as it were, astride over one edge only of the next, as in sedges. However folded or rolled, leaves are generally vertical in the bud and, except when revolute, expose the under or transpiring surface. They are also frequently glutinous or hairy—all adaptations against the radiated cold of early spring in the northern hemisphere.

Verne, JULES, story-writer, was born at Nantes, France, on February 8th, 1828, and began his literary career by writing small pieces for the theatres. He made a brilliant success by following out the ingenious idea of writing what may be termed scientific novels, though sometimes there is little genuine science in them, and giving free play to his imagination, combined with the dramatic instinct of his countrymen. They are based on a scientific fact, which is then elaborated in a most fantastic manner. There were few more popular or more prolific writers, perhaps his best works being *De la Terre à la Lune*, *Le Voyage au centre de la Terre*, *Vingt mille lieues sous les Mers*, *Michel Strogoff*, *Hector Servadac*, and *La Tour du Monde en quatre-vingt Jours*. Having been translated into many tongues, his books literally enjoyed a world-wide circulation. He died at Amiens on March 24th, 1905.

Vernet, the name of three generations of distinguished French painters. CLAUDE JOSEPH VERNET was born at Avignon on August 14th, 1714. After working as a boy for his father, a decorative painter, he studied at Rome. A great fondness for the sea induced him to take up sea-

scape, which he almost made his speciality, producing every variety of subject and becoming one of the foremost painters of sea-pieces of his time. He was summoned from Rome in 1753 to paint for the King the series of pictures of the seaports of France now in the Louvre. He died in Paris on December 3rd, 1789. His youngest child, ANTOINE CHARLES HORACE VERNET, usually styled CARLE VERNET, was born at Bordeaux, on August 14th, 1758. He displayed remarkable aptitude as a child for the drawing of horses and, having won the Grand Prix (1782), proceeded to Italy to prosecute his studies. For a time he lost interest in art and was on the point of entering a monastery when his father recalled him to Paris. Here he soon took to painting again, his "Triumph of Paulus Æmilius" (1791) commanding general praise. The Revolution once more discouraged him, but the victorious career of Napoleon Bonaparte aroused his admiration, and he produced canvas after canvas to celebrate *la gloire*. The "Battle of Marengo" (1806) attracted universal attention, and the



VERONA.

Emperor gave him the Legion of Honour for the "Morning of Austerlitz" (1808). He died in Paris on November 17th, 1835. His son, EMILE JEAN HORACE VERNET, the grandson of Claude Joseph, was born in Paris on June 30th, 1789. His battle pictures, clever and even brilliant as improvisations, had a great vogue. At the age of twenty he exhibited the "Taking of an Entrenched Camp." His "Defence of the Barrier at Clichy" was a popular picture, but one of his best (1822) is the picture of himself at work in his studio, whilst surrounded by vivacious visitors whose bustle in no way incommodes him. Visits to Algeria, Egypt and Palestine afforded subjects for several of his most admirable pictures ("Le Conteur Arabe," "Prière dans le Désert," "Chasse au Lion," "Bombardement de Tanger" and "L'Occupation de Mogador"). Later the family tradition called to him strongly and he painted many battle pictures of Napoleon, of the siege and capture of Constantine and of the Crimea. "Judith with the head of

Holofernes" (1830) and "The Slave Market" (1836) are two of his best-known canvases. He died in Paris on January 17th, 1863.

Vernier, a simple mechanical device for enabling one to read the divisions of a scale much more accurately than can be done with the scale itself. It was named after its inventor, the French mathematician, Pierre Vernier, who was born at Ornans, in the department of Doubs, in 1580, and died there on September 14th, 1637.

Verona, a province and its capital in North-East Italy. The former has an area of 1,185 square miles, bounded by the Mincio and Lake of Garda on the W., Vicenza on the E., Tyrol on the N., and the Po on the S. It is traversed by the Adige and, though mountainous in the north and marshy in the south, pastures many cattle and grows corn, vines, mulberry-trees and fruits. Population of the province (1901), 422,437. VERONA, the capital, situated on the Adige, 62 miles W. of Venice, was colonised by Julius Caesar, and is one of the most interesting cities to the archaeologist. It is walled, and possesses strong modern fortifications, being one of the fortresses that form the Quadrilateral (the others being Peschiera, Mantua and Legnago). The cathedral, rebuilt in the 12th century, containing Titian's "Assumption," the church of St. Zeno, a Byzantine structure of the 9th century, Santa Anastasia and San Stefano are among its ecclesiastical glories. The well-preserved amphitheatre, the Porta dei Borsari and other remains recall the Roman period. The tombs of the Scaligers, the palaces of the Moneschalchi and the Bishops; the Gran Guardia and the Consiglio bear witness to mediæval taste and grandeur. Considerable industries exist, dyeing and the making of silks, velvets and woollen fabrics being the most important. A large trade is carried on in local produce. Although Verona is pleasantly situated, its winter climate is apt to be cold, rainy and cheerless. Pop. (1901), 74,271.

Veronese, PAOLO, painter, was born at Verona in 1528, and was called after that place, his real name being CAGLIARI. After completing his art studies under his uncle, Antonio Badile, he received a commission to decorate Mantua Cathedral, for which his "Temptation of St. Anthony" was painted. In 1555 he proceeded to Venice, and there formed one of the great trio of Titian, Tintoretto and Veronese. He executed some magnificent works for the Venetian churches, works like his superb "Marriage at Cana" (now in the Louvre) and "The Story of Esther." Most of his works describe Scriptural scenes, especially those relating to the life of Christ. He died in Venice on April 20th, 1588. He was the most pictorial of all the painters, an admirable draughtsman, composer and colourist. In the National Gallery in London he is represented by the famous canvas "The Family of Darius at the feet of Alexander the Great after the

battle of Issus," and also by "St. Helena's Vision of the Cross."

Veronica, a genus of Scrophulariaceous plants comprising about 160 species of herbs and shrubs,



"THE MARRIAGE AT CANA."

(From the painting by Paul Veronese, in the Louvre.)

mostly belonging to the North Temperate zone, but represented in Australia. There are fifteen small British species, and several others are cultivated as hardy border-plants. They have opposite or whorled leaves, racemose inflorescences, sub-rotate corollas, two diverging stamens and flattened, two-chambered, few-seeded capsules. Two of the five sepals and

Versailles, the capital of the department of Seine-et-Oise, France, a handsome and regularly-planned city, 10 miles S.W. of Paris, affording an agreeable suburban retreat to the inhabitants of the capital. Until 1660 it was a mere village, but

Louis XIV. built here (finished in 1672) the famous palace, for many years the chief residence of the French Court, and laid out the splendid gardens and picturesque park. The building was designed by Lebau in the Renaissance style associated with the name of Mansart, and contains gorgeous suites of apartments and galleries, now used as a national museum of historical art. The terrace overlooks the well-known fountains, beyond which stretch the avenues of the park. Two minor palaces, the Great and the Little Trianon, the latter erected for the use of Marie Antoinette, stand a short

distance away, and in the town is the historic Tennis Court, the cradle of the French Revolution. Except on the rare occasions when a National Assembly is held, the palace of Versailles serves only as a museum. The town was occupied by the Germans from September 18th, 1870, to March 7th, 1871, and the Galerie des Glaces in the palace



VERSAILLES: THE PALACE.

two of the petals are so fused as to appear in each case like four, but of the resulting four corolla-lobes the posterior is generally larger and the anterior smaller than the two lateral ones. The English species are known as speedwells. The flowers are blue, lavender, violet, or white.

was the scene of the proclamation, on January 18th, 1871, of William I. as German Emperor. Pop. (1901), 54,982.

Vertebrates, or VERTEBRATA, one of the main divisions of the animal kingdom, containing those

forms which possess a backbone. By some writers the term is limited to the Craniata or True Vertebrates, while others employ it to denote all the Chordata. In the former case Amphioxus and the Hags and Lampreys are excluded. The following is the customary scheme of classification:—

Cyclostomata (Hags and Lampreys).	} Ichthyopsida.
Pisces (Fishes)	
Amphibia (Frogs and Toads)	
Reptilia (Snakes, Lizards, Crocodiles, Tortoises)	
Aves (Birds)	} Sauropsida.
Mammalia (Mammals).	

Verticillaster, or FALSE WHORL, two glomerules, or sessile, cymose clusters, generally in the axils of a pair of opposite leaves, forming together an apparent whorl of flowers round the stem. It occurs commonly among Labiata, where sometimes a number of these verticillasters succeed one another in a spicate or capitate manner, as, for example, in the mints.

Vertigo, a feeling of giddiness, or swimming in the head, accompanied with a sensation as if everything were moving before the eyes and the sufferer were about to faint. It may only be due to temporary disorder of the stomach, or derangement of the liver, as in biliousness, and sometimes occurs in sea-sickness. In such cases it should readily yield to a blue pill (at night) and black draught (next morning), along with correction of dietetic errors and with daily exercise in the open air. But giddiness may have a more serious origin. It may be a symptom of overwork, anæmia, severe bleeding and even some form of brain disease. There may also be deafness and a very unpleasant singing in the ears. Should worry and overwork be at the bottom of the mischief a 5-grain tabloid of bromide of sodium taken with a glass of water often brings relief. The treatment for anæmia will get rid of such vertigo as may arise from this source. But if there be reason to suspect that the trouble may be more deeply rooted, then the doctor should be requested thoroughly to overhaul the patient. Intoxicants in every form should be given up permanently.

Vespasianus, TITUS FLAVIUS SABINUS, Roman Emperor, was born near Reate, in the Sabine country, in A.D. 9, and was of humble parentage. By his valour he attained to high rank in the army. He commanded a legion in Britain, where he reduced the Isle of Wight and advanced westwards into Devonshire as far as the vicinity of Exeter. In the year 51 he became consul. He was named proconsul in Africa by Nero. After Vitellius had reached the throne, Vespasian opposed him and, backed by powerful military influence, as well as the unfavourable character of his rival, for Vitellius was a disgusting glutton, was proclaimed Emperor at Alexandria. Vitellius was forthwith murdered, and Vespasian succeeded him in 69. He shamed the luxurious nobles by his simple life, maintained the discipline of the army and improved the tone of the Senate. After the fall of Jerusalem in 70 he and Titus shared a triumph in common—the first

in which father and son were thus associated—and for the rest of Vespasian's life peace ruled throughout the Roman empire. He died in 79. The avarice which has been laid to his charge was probably a wise frugality or enlightened economy. He helped to beautify Rome, the Temple of Peace and the Colosseum having been begun in his reign.

Vespertilionine Alliance, so named from its including the common Bats (Vespertiones), one of the two groups into which the sub-order Microchiroptera, or Insectivorous Bats, is divided. The tail is contained within the membrane between the thighs, excepting the extreme tip, which projects a very little. The premaxillary bones are rudimentary and the upper incisor teeth which they carry are small and weak. The first phalanx of the middle finger is extended in repose in a line with the metacarpal bone. The classification was proposed by George Edward Dobson, F.R.S. (1848-95), who had made the study of the Chiroptera one of the main occupations of his life and was the chief authority on the order.

Vespucci, AMERIGO, navigator, was born in Florence, Italy, on March 9th, 1451. He adopted a mercantile career and, having a good working knowledge of geography, astronomy and natural philosophy, was seized with the passion for exploring which distinguished the era of Columbus. He sailed on an expedition from Cadiz in 1497 and is supposed to have made the coasts of Campeachy Bay and North Carolina, returning to Spain in the following year. In 1499 he reached the coast of Brazil in a second expedition, and was home again in September, 1500. He made two and possibly four more voyages to South America, and died at Seville on February 22nd, 1512. Although he appears never to have filled a commanding position, he is immortalised in consequence of the vast continent being named after him. He was undoubtedly inclined to exaggerate—the weakness of some explorers—and is said to have misrepresented the date of his visit to America. He succeeded Columbus as chief pilot of Spain in 1505.

Vesta, a goddess of light, whose special function it was to watch over the fire of the household hearth. The Greeks called her Hestia, and she was always personified as a virgin and as an emblem of purity. To keep a fire constantly burning in the towns was regarded as a necessary tribute to her. In Rome, where it was believed the sacred fire came from Troy, it was kept burning in a temple in the Forum, and was tended by six priestesses, who bore the name of vestals, as they were obliged to be virgins, and were punished, if they broke their vows, by being buried alive. While vestals they were held in the greatest honour. Vesta's festival was the 9th of June.

Vestments, the garments worn by the officiating clergy during public worship. It is now generally agreed that the vestments adopted by the Christian Church originated in the ordinary garb of Roman citizens. Thus, of the three vestments mentioned at the Fourth Council of Toledo

(633), the alb has been identified with the Roman tunic, the planeta or chasuble with the toga, and the orarium or stole with a garment worn by Roman matrons. These remained unaltered in the services of the Church, whereas in daily life they disappeared or became modified owing to changes of fashion. In the Anglican Church the Ornaments Rubric (1662) prescribed that the vestments to be used were such as were worn in the second year of Edward VI. (1549), but this has been held by the Privy Council to have been modified by the Injunctions (1559) and Advertisements (1564) of Elizabeth, according to which the only legal vestments are the surplice and hood for all ordinary purposes and the cope for the administration of the communion in cathedral and collegiate churches on high feast days. Bishops wear the rochet and there is authority for the chasuble, alb and tunicle. Attempts to enlarge the number of the ornaments have been made by the Ritualist party in the Anglican Church, not without difficulty and strife.

Vesuvius, an active volcano on the eastern shore of the Gulf of Naples, Italy, and about 10 miles S.E. of the city. The base of the mountain is about 30 miles in circumference, and the height



NAPLES AND VESUVIUS.

(From a photo by Sommer, Naples.)

varies from 3,900 to 4,300 feet, according to the amount of material ejected or removed by volcanic activity. A funicular railway leads to the edge of the crater, which has a diameter of half a mile and a depth of 350 feet. The first recorded eruption was that of A.D. 79, which engulfed Herculaneum and Pompeii and caused a loss of perhaps 200,000 lives, Pliny the Elder being a victim. It was described by the Younger Pliny in two letters addressed to the historian Tacitus. Sixty movements of greater or less violence have since ensued, of which the chief dates are 1036 (the first recorded discharge of liquid lava), 1631 (overwhelming Torre

Annunziata, Torre del Greco and other places), 1759, 1767, 1794, 1822, 1855, 1861, 1865, 1868, 1872, 1878-9, 1885, 1891, 1895, 1903 and 1905.

Vetch (*Vicia sativa*), an annual Leguminous plant, with pinnate leaves ending in tendrils, subsessile, axillary, pea-like, pale purple flowers, solitary or occasionally in pairs, and silky linear pods one to three inches long, containing from four to ten seeds. It is extensively grown as a green fodder plant, some 400,000 acres being annually sown in the United Kingdom.

Veto, a political term denoting—(1) the constitutional power possessed by one branch of the government of preventing measures passed by another branch from becoming law, or of refusing its sanction to some administrative act; (2) the right of a single member of a legislative body to cause the rejection of any proposal by his adverse vote. The right of veto, the sole legislative function which still appertains to the British sovereign, has not been exercised since 1707. The President of the United States possesses only a qualified veto for his decision may be overridden by that of a two-thirds majority of both Houses of Congress. The German Emperor has no veto on laws passed by the Bundesrat, or Federal Council, and the Reichstag, or Diet of the Realm. The most striking example of the second kind of veto was the Polish *Liberum Veto*, entitling any deputy to the Imperial Diet to prevent further discussion on a matter by uttering the words *Nie pozwalam* ("I do not permit it").

Viaud, LOUIS MARIE JULIEN, author, better known by his *nom de guerre* of PIERRE LOTI, was born at Rochefort, France, on January 14th, 1850. He entered the navy and served in the Pacific, the Tongking campaign and China. His experiences in Eastern waters have been utilised in his writings and he was suspended for a few months in 1883, for commenting in the *Figaro* on the cruelties alleged to have been perpetrated by French soldiers at the capture of Hué. In 1891 he was elected to the French Academy. Among his works were *Azizade* (1876-7), *Marahu* (1880)—a Polynesian idyll afterwards republished under the title of *Le Mariage de Loti*, *Le Roman d'un Spahi* (1881), *Fleurs d'Ennui* (1882), in which the pessimistic note was handled not unpleasantly, *Mon Frère Yves* (1883), *Les Trois Dames de la Kasbah* (1884), *Pêcheurs d'Islande* (1886), translated by Queen Elizabeth of Roumania, *Madame Chrysanthème* (1887), *Japoneries d'Automne* (1889), *Au Maroc* (1890), *Le Roman d'un Enfant* (1890), revealing a fine insight into child character, *Le Livre de la Pitié et de la Mort* (1891), translated by T. P. O'Connor, M.P., *Fantôme d'Orient* (1892), *L'Exilic* (1893), *Le Désert* (1895), *Jérusalem* (1895), *La Galilée* (1895), *Pages choisies* (1896), *Ramuntcho* (1897), *Reflets sur la Sombre Route* (1898), *Figures et choses qui passaient* (1898), *L'Inde sans les Anglais* (1903), *La Troisième Jeunesse de Mme. Prune* (1905). *Mon Frère Yves* and *Pêcheurs d'Islande* are commonly regarded as his masterpieces.

Vibracula, certain zooids in a colony of Bryozoa modified into the form of long whip-like

cords. They are flexible, and serve either to remove foreign bodies or for purposes of defence; in the few free Bryozoa they also serve for locomotion. In their simplest whip-like type they may be seen in the Common Sea-mat or Flustra; their highest development is met with in such forms as Lunulites or Biscenaria, which are free.

Vicar (Latin, *vicarius*, "deputy,"), in English ecclesiastical law, denotes the priest of a parish the tithes of which are appropriated (or belong to a chapter or religious house) or impropriated (belonging to a layman), who receives only the smaller tithes or a salary. In the Catholic Church the vicar is an ecclesiastic who assists a bishop and exercises jurisdiction in his name, though acts properly accruing to the episcopate cannot be delegated to him, nor can he collate to benefices without express sanction. The assumption by the Pope of the title of Vicar of Jesus Christ has reference to his claim to stand in the place of Jesus on earth and to possess His authority in the Church.

Vicenza (Roman, *VICENTIA*), a province and its capital in North-East Italy. The former has an area of 1,056 square miles, bordering on Tirol, broken by the spurs of the Alps, and drained by the Brenta and Bacchiglione. Timber, coal, silk and agricultural produce are the chief resources. Pop. (1901), 447,999. *VICENZA*, the capital, stands on the Bacchiglione, 37 miles N.W. of Venice, and possesses a cathedral, triumphal arch and several fine palaces and other structures designed by Andrea Palladio (1518-80), a native of the place. Among leading buildings may be mentioned the Palazzo della Ragione (town hall), the Basilica Palladiana, the Municipio, the Teatro Olimpico, the Palazzo Chiericati (containing the municipal museum), and the Palazzo Porto-Barbarano. Woollen and silken fabrics, jewellery, machinery, musical instruments and wooden wares are extensively manufactured, and there is a good market. Pop. (1901), 44,777.

Victor Emmanuel II., King of Sardinia and subsequently of Italy, was born at Turin, Italy, on March 14th, 1820, his father being Charles Albert, King of Sardinia, whom he succeeded in 1849. He had taken part in the revolution of 1848 and in the war against Austria, and with the aid of Cavour suppressed the small revolts of Sardinia. In the war of 1859, when he gained Austrian Lombardy, but lost Nice and Savoy, and when Tuscany afterwards yielded to him, he showed much personal bravery. Later Garibaldi added Naples and Sicily to his possessions. In 1861 he was proclaimed King of Italy. In September, 1870, he entered Rome, the capital of the Papal States, and annexed them, the temporal power of the Popes being destroyed at a blow and the unification of Italy rendered complete. He survived this event eight years, dying at Rome on January 9th, 1878. If he were not a king, he was a patriot and an honest man, acquiring this very nickname, "Re galantuomo," in fact, by resolutely maintaining the constitution in Sardinia's darkest hour following her defeat at Novara (March 23rd, 1849), when the Austrians under Radetsky overwhelmed her army.

Victoria (ALEXANDRINA VICTORIA), Queen of the United Kingdom of Great Britain and Ireland and Empress of India, was the only child of Edward, Duke of Kent, fourth son of George III., and the Princess Mary Louisa Victoria (1786-1861),



QUEEN VICTORIA.

(Photo: Hughes & Mullins, Ryde.)

daughter of Francis, Duke of Saxe-Coburg, and was born at Kensington Palace on May 24th, 1819. The Duke of Kent died in 1820, and the education of the princess was directed, under her mother's care, by the Duchess of Northumberland, wife of the third duke, and more especially by Frau Louise Lehzen, daughter of a Lutheran clergyman of Hanover, who had acted as governess to Princess Fédore of Leiningen, Princess Victoria's stepsister. She succeeded her uncle, William IV., on June 20th, 1837, and was married on February 10th, 1840, to Prince Albert of Saxe-Coburg-Gotha, who died at Windsor Castle on December 14th, 1861. In 1876 Her Majesty assumed the title of Empress of India. In 1887 she celebrated her Jubilee amid general rejoicing, and in 1897 her Diamond Jubilee. On January 22nd, 1901, she died at Osborne House, and was succeeded by her son, Edward VII. She reigned during her long tenure of the throne with marked ability, and endeared herself greatly to her people. In 1868 she published extracts from her diary under the title of *Leaves from a Journal of Our Life in the Highlands from 1848 to 1861*, which was followed in 1883 by another series of *More Leaves*. The artless simplicity of both works gained for them a widespread circulation. This quality was also conspicuous in the selection of her *Letters* published in 1907.

Victoria, a state of the Commonwealth of Australia, occupying the south-eastern corner of the island-continent, bounded on the N. and E. by New South Wales, on the S. by Bass Strait and the

South Pacific and on the W. by South Australia, the Murray being a natural boundary on the north. It covers an area of 87,884 square miles. The western surface consists mostly of open park-like grass lands; in the south-central region are the Pyrenees, of which the highest point is Mount Williams (3,600 feet); in the east occur the Australian Alps (Mount Hotham, 6,400 feet, being the highest point). The rivers (excepting the Murray) are not navigable and include the Mitta Mitta, Ovens, Campaspe, Loddon (with the Goulburn) and other right-hand affluents of the Murray; the Snowy, Tambo, Mitchell, Latrobe and Yarra flow to the ocean. There are a few lakes, some intensely salt. The characteristic flora includes the eucalyptus, the dwarf eucalyptus or mallee scrub, the black and yellow wattle (acacias), the casuarina and tree-ferns, while the fauna comprises the kangaroo, opossum, wombat and other marsupials, parrots and cockatoos in vast numbers, the kingfisher known as the laughing jackass and several snakes, some of which are venomous.

The climate is remarkably healthy, ice and snow being almost unknown. Millions of sheep, yielding a valuable wool-clip, are pastured, and the principal crops are wheat, oats, barley, potatoes, hay, grapes, hops and tobacco. All northern fruits grow well, besides many sub-tropical kinds, but the climate is not hot enough for the sugarcane, pine-apple, or banana. Gold is the leading mineral and tin, copper, antimony, lead, zinc, iron, manganese, bismuth, cobalt and coal are found. Supreme authority is vested in a Legislative Council and Legislative Assembly, the members of the latter receiving a yearly salary, and the executive government is in the hands of a Governor, nominated by the Crown, assisted by a Ministry appointed by the Governor but responsible to the Legislature. Originally settled as Port Phillip in 1834, Victoria soon developed into a thriving pastoral and agricultural community, when in 1851 the discovery of gold caused an enormous influx of population and brought in the course of the next generation some two hundred millions of money into the country apart from capital introduced by settlers. Melbourne, its capital (515,350), soon rivalled the great cities of Europe, railways were opened up, commerce received a startling impulse, nor did education, religion and political institutions languish. When the gold fever passed away (though mining still employs many thousands of hands), a solid basis of prosperity had been laid. Latterly the production of wine, silk, fruits, and even butter, for the European markets has steadily advanced, and the trade in frozen meat has reached large proportions. Pop. (1901), 1,201,341.

Victoria, capital of British Columbia, finely situated on an arm of the sea in the south-east of Vancouver Island, Canada, 113 miles by steamer and rail S.W. of New Westminster, the former capital. It is quite modern, having until 1858



SKETCH-MAP OF VICTORIA.

been a station of the Hudson Bay Company. The principal structures are Government Buildings, the City Hall, Court House and the Anglican Cathedral. It also contains a fine park and is a favourite holiday resort. The industries include the canning of salmon, powder-making, pottery, lumbering, brewing and distilling. Pop. (1901), 20,816.

Victoria Cross, a decoration conferred upon a British sailor or soldier for conspicuous bravery or devotion to his country in the presence of the enemy. It is tacitly agreed that this courage shall not be such as might naturally be expected in the ordinary discharge of duty. Queen Victoria had been profoundly impressed with the number of heroic deeds performed on sea and shore during the Crimean War and, desiring to stamp them and similar acts with the seal of her approval, instituted this decoration by Royal warrant on January 29th, 1856. Old soldiers who had been through the Peninsular War and had fought at Waterloo did not take kindly to the notion of decorating a sailor or soldier for that he was brave. When they asked, had English, Irish, Welsh or Scots ever been otherwise? Nevertheless the Queen persisted and on June 26th, 1857, the first distribution of the decoration took place in Hyde Park, London, on which occasion Her Majesty herself pinned the cross on the breast of each of the sixty-two recipients of the honour. The decoration is said to have been designed by the Prince Consort, and consists of a Maltese cross of bronze. In the centre is the royal crown surmounted by a lion and, below, on a

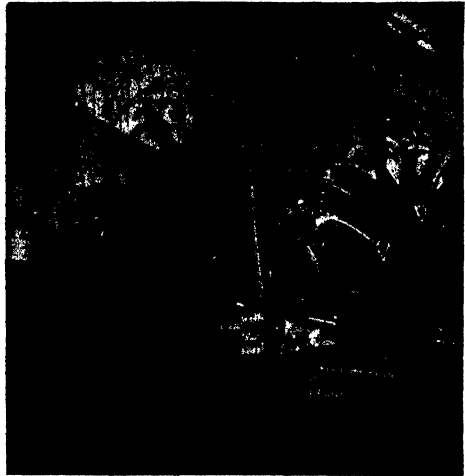
scroll, the words, "For Valour." From the clasp, on which is a double branch of laurel, the cross is suspended on a V-shaped support. The ribbon is blue for the navy and red for the army, and a further act of bravery by the same man is marked by a bar on the ribbon. The cross carries a pension of £10 a year for non-commissioned officers and men and an extra £5 for every bar. Though gazetted No. 24, the first man entitled to receive the cross chronologically was Midshipman (afterwards Admiral) Charles David Lucas for gallantry during the bombardment of Bomarsund on June 21st, 1854. It was a happy chance that gave a member of the senior service pride of place. For an account of the decoration and the story of some typical exploits by which it was won see *Valour for Victoria* by James A. Manson.

Victoria Falls, on the Zambesi, 900 miles from its mouth. This cataract, the grandest in the world, was discovered by Dr. Livingstone in 1855 in the region now called Rhodesia. The Makololo named it *Mosi-oa-tunya* ("where the smoke sounds"), but the traveller christened it afresh after his queen. The width of the river above the Falls is 1,000 yards. The stream, broken by a few islands, ultimately reaches a fault in the strata and takes a precipitous plunge down the chasm of 360 feet, the width at this point being 573 yards. Below the cascade the river winds for a considerable distance through cañons not more than 30 yards wide. The columns of vaporous spray are visible at a distance of 20 miles. The river is now crossed near the Falls (which have become one of the sights of South Africa) by a railway bridge.

Victoria Nyanza, a lake in Central Africa traversed by the equator, and lying E. of 31° 40' E. It occupies a huge trough about 4,000 feet above sea-level, is studded with islands and surrounded in parts by lofty cliffs. It was discovered in 1858 by John Hanning Speke, who explored it in company with James Augustus Grant four years later, Sir (then Mr.) Henry Morton Stanley effecting the circumnavigation in 1875. It has a length of about 300 and a maximum breadth of 190 miles, with an area (exclusive of islands with an estimated area of 14,000 square miles) of no fewer than 27,900 square miles. The White Nile issues from its northern extremity by Napoleon Channel and Ripon Falls, and flows thence to Albert Nyanza, about 300 miles to the N.W.

Victoria regia, a magnificent water-lily inhabiting the north-eastern rivers of South America, which has been grown successfully for some years in English conservatories. It has a fleshy rhizome, petioles armed with remarkable prickles, and peltate floating leaves, six to twelve feet across, turned up all round from one to three inches above the water, and resembling immense trays. The veins are prominent on the lower surface and spinous, as is also the calyx. There are four reddish, deciduous sepals; numerous, multiseriate, white and rose-colour petals and stamens, the innermost of the latter being sterile; and a cup-like ovary with projecting, radiating stigmas and many-seeded

chambers. The fruit is prickly, and ripens at the bottom of the water.



VICTORIA REGIA.

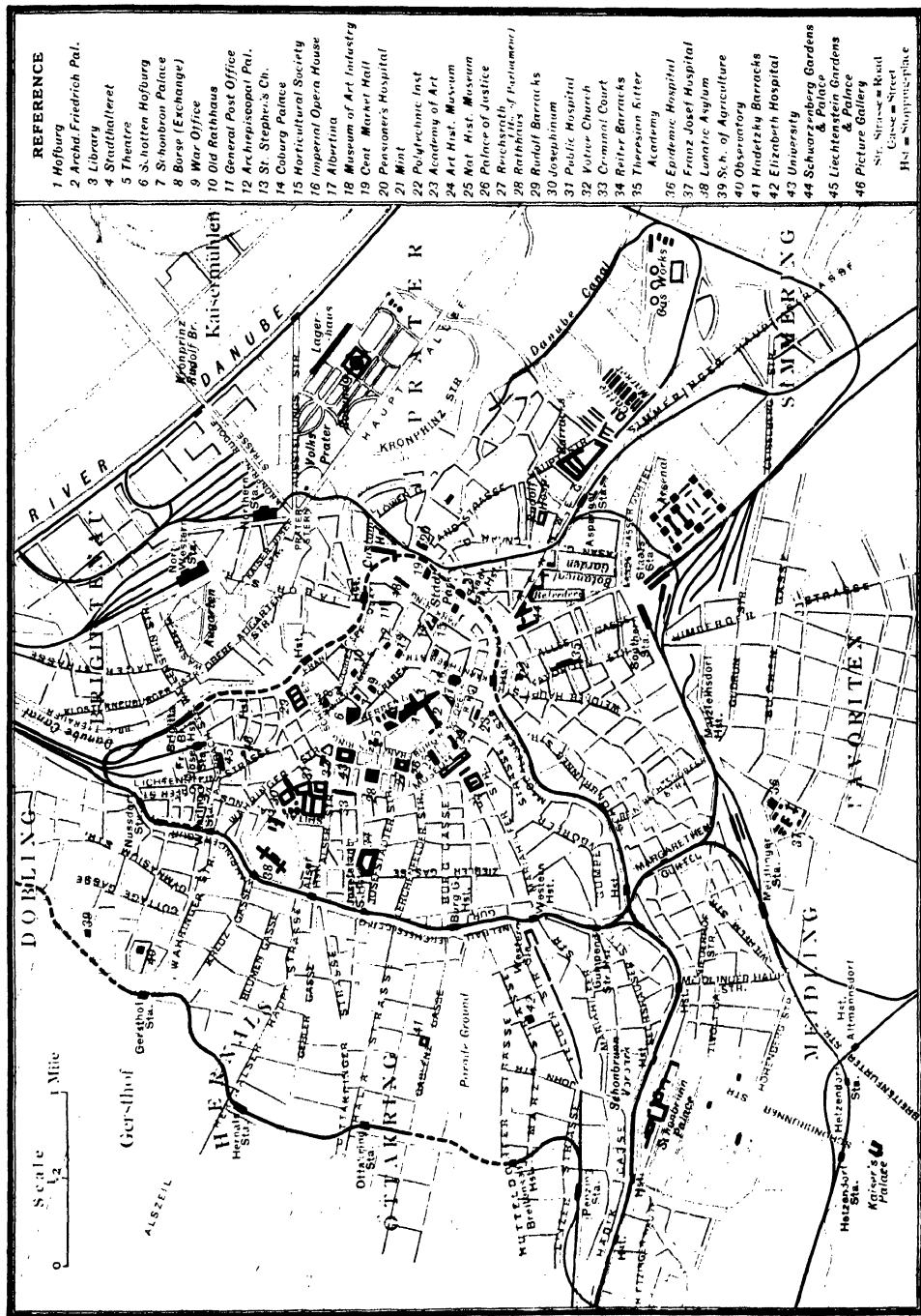
(Photo : Pictorial Agency.)

Victoria University. [OWENS COLLEGE.]

Victualling. The victualling department of the British navy has since 1869 been under the control of a civil official at the Admiralty. The great victualling yard at Deptford supplies those at Portsmouth and Devonport as well as the depôts abroad. The victualling stores comprise food, clothing, soap and tobacco. Rations (for which in some cases a sum of money may be substituted) are issued to all officers and men on full pay, under the superintendence of the paymaster. Men on board merchant-ships are victualled in accordance with the Merchant Shipping Act.

Vicuña (*Auchenia vicugna*), a ruminant animal of the camel tribe, the smallest of the genus *Auchenia*, standing about 30 inches at the shoulder. The wool is light brown, fading into white on the under-surface, and is of considerable value in textile manufactures. The vicuña is a native of the highlands of Bolivia and Chile, and is hunted for its wool and flesh. [ALPACA.]

Vienna (Roman, VINDOBONA, German, WIEN), the capital of the Austrian Empire, on the Danube Canal, a right bank loop of the Danube, at the foot of the Wiener Wald, an offshoot of the Styrian Alps. The old or inner city, once walled or fortified, is now connected with the surrounding suburbs by extensive boulevards, known as the Ringstrasse, two miles long and 150 feet broad, and containing many handsome modern structures. Within the area of the Innere Stadt are the Hofburg or Imperial Palace, the noble Gothic cathedral of St. Stephen (with a spire 450 feet high), the New Court Theatre and the Opera House. Here the streets are narrow, but the



newer quarters are laid out with regularity and splendour, magnificent houses and fine public and private gardens being everywhere met with. In other quarters of the city are the Parliament House (Grecian), the New Rathaus (flamboyant Gothic), the Palace of Justice, the University (founded in 1365), the Public Hospital (the largest in Europe), the Votive church (erected as a thank-offering for the escape of the Emperor Francis Joseph from assassination in 1853), the Imperial Museums of Art and Natural History (the latter containing a vast dome painted by Hans Makart), the Academy of Art, the Belvedere Palace, the Arsenal and the Exchange. There are several fine public parks, including the noble Prater, situated in the east between the Canal and the Danube. To the S.W. lies Schonbrunn, the summer palace of the Emperor, amidst gardens of great beauty. Tramways connect all parts of the city, and railways provide communication with Paris, Berlin, Constantinople and Italy. The Viennese are a gay, pleasure-loving people, passionately fond of dancing, while the women have as good a claim as their Parisian sisters to set the *ton* in fashion. The manufactures include textiles, machinery, ironware, carriages, bentwood furniture, meerschau pipes, jewellery, leather, *objets d'art* in bronze, terra cotta and porcelain, and fancy goods; but the city is fully as important as a distributing centre. The Danube is navigable for steamers of moderate draught, upwards to Ulm and downwards to the Black Sea. Originally the headquarters of a Roman legion, Vienna was incorporated by Charlemagne in his dominions, and in later days for some centuries stemmed the inroads of the Turks. Occupied by Napoleon in 1805 and 1809, it became in 1814 and 1815 the seat of the famous Congress which sought to undo the conqueror's work. Pop. (1900), 1,674,957.

Vienne, a department of France, taking its name from a river which rises in the department of Corrèze, and, passing Limoges, Châtellerauld and Chinon, joins the Loire after a course of 190 miles. It is bounded on the N. and N.E. by Indre-et-Loire, on the E. by Indre, on the S.E. by Haute-Vienne, on the S. by Charente, on the W. by Deux-Sèvres, and on the N.W. by Maine-et-Loire. It has an area of 2,711 square miles, and is for the most part level, producing wheat, rye, barley, oats, maize, potatoes, beetroot, hay, flax, hemp and grapes. Horses, mules, asses, cattle, sheep, pigs and goats are bred in large numbers. Iron is found and worked into cutlery and arms at Châtellerauld, and lithographic stones form a valuable product. Other industries are iron-founding, textiles, paper-making, tanning, pottery, flour mills, brewing and distilling. Poitiers (39,565) is the capital, and most of the old province of Poitou is included in the department. Pop. (1901), 336,343.

Vienne (Roman, VIENNA ALLOBORGUM), one of the most ancient towns of France, in the department of Isère, on the left bank of the Rhône, where the Gère joins it, about 48 miles N.W. of Grenoble. It was the capital of the Allobroges, and under the Roman emperors became the centre of the

Viennensis. In the 5th century it was the capital of Burgundy, and was not finally annexed by France until 1448. A general council was held here in 1312, which suppressed the order of the Knights Templars. There are remains of an amphitheatre, of a triumphal arch, a temple to Augustus and other interesting antiquities. The Gothic cathedral of St. Maurice dates from 1245. The smelting of iron and lead and the making of textiles, ropes, yarn, paper, glass and bricks are the chief industries, but there is a large trade in the wine known as Côte-Rotie. Pop. (1901), 22,768.

Vienne, HAUTE-, a department of France, occupying an area of 2,119 square miles, mostly carved in 1790 out of Limousin, La Marche, Poitou and Berry, bounded on the N. by Indre, on the E. by Creuse, on the S.E. by Corrèze, on the S.W. by Dordogne, on the W. by Charente, and on the N.W. by Vienne. The outlying ranges of the Auvergne Mountains spread into the central and southern portions and contain iron, lead, tin, antimony, marbles of various qualities and an abundance of porcelain clay. The soil is too poor and the climate too moist for successful agriculture, and chestnuts supply the food of the bulk of the population. Wheat, rye, barley, oats, maize, potatoes, turnips, beetroot, hemp, flax and grapes are grown, and the pastures maintain a fine breed of horses and many sheep, cattle and pigs. The manufactures include porcelain, paper, textiles, leather, carriages and agricultural implements, besides iron-founding, printing and distilling. The capital is Limoges (84,121). Pop. (1901), 381,753.

Vigfussen, GUDBRANDR, Scandinavian scholar, was born at Broadfirth, in Iceland, on March 13th, 1827, and educated at Copenhagen. He came to England in 1864, and in 1884 was appointed Icelandic reader at Oxford, where he died on January 31st, 1889. His *magnum opus* was the completed edition of Cleasby's *Icelandic Dictionary* (1873), which, in its present form, is mainly his work. He also brought out the *Corpus Poeticum Boreale* (1883), in conjunction with F. York Powell, furnished the valuable introduction to the *Sturlunga Saga* (Oxford, 1878), and edited various other sagas.

Vilela, a South American people formerly powerful in the Gran Chaco region, Argentina. Jointly with the kindred and allied Lule nation, they occupied most of the territory about the Upper Salado basin as far north as the Rio Vermejo, in the present state of San Juan. Both branches of the family have now nearly disappeared, having been either exterminated during the long frontier wars or absorbed in the surrounding Argentine populations. In the old huacas (burial-places) are found those remarkable sepulchral urns, nearly all containing the remains of children, who are supposed to have been sacrificed to the gods to obtain good harvests or victory over their enemies.

Village Communities. The theory that the primitive form of agriculture was the joint cultivation of lands held in common by a free tribe was first promulgated by G. L. von Maurer

in 1854. Communities certainly exist, or have existed, throughout the world whose system of cultivation might be explained by this hypothesis, the Russian *mir* being their best type, though instances are numerous both in Europe and Asia. A redistribution of the land into new lots took place at intervals of a few years, the rotation of crops being prescribed by the village council in accordance with immemorial custom. Traces of the three-field system, by which the whole mark was divided into three strips, one of which lay fallow, while on either of the others a different crop was raised, abounded in England within a recent period, and even now are not altogether extinct. One of the most curious features of the mark is that the plots belonging to a single family were scattered about indiscriminately among the three strips. The mark system was universal in the Middle Ages and, in spite of the growth of large farms, prevailed in England up to the middle of the 18th century. Frederic Seebohm, Fustel de Coulanges and later critics of Von Maurer and Sir Henry Maine, trace back the mark, not to a free village community, which they regard as mythical, but to an organisation of free lords and servile tenants like that maintained in the feudal system.

Villars, CHARLES LOUIS HECTOR, DUC DE, general, was born at Moulins, France, on May 8th, 1653. In his youth he served under Louis XIV. in Holland and under Condé and Turenne in Germany. As ambassador at Vienna (1699-1701) he was very successful in upholding French interests. Sent to aid the Elector of Bavaria, who had joined France in the War of Succession (1702), he gained several important advantages, but the Elector's timidity prevented his projected march on Vienna. In his suppression of the rising of the Camisards, the Protestants of the Cévennes, his humanity was no less conspicuous than his military skill. In 1705 he prevented Marlborough from crossing the north-eastern frontier of France and conducted a successful campaign in Alsace. In 1709 he was defeated by Marlborough at Malplaquet, receiving wounds which disabled him for two years. His brilliant successes against the Allies in 1712 restored the fallen fortunes of the French, who were able to negotiate the Treaty of Utrecht (1713) and the Peace of Rastadt (1714). He now became very powerful at Court, but in 1732 withdrew from public affairs, owing to the opposition of Fleury. In the War of the Austrian Succession (1733) he commanded for a short time in Italy, and died at Turin, on his way back to his native land, on June 17th, 1734.

Villeneuve, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE, admiral, was born at Valensoles, France, on December 31st, 1763, and entered the navy in his fifteenth year. Placed in command of the Toulon squadron in 1805, he succeeded in luring Nelson across the Atlantic, but did not thereby effect his plan of releasing the French fleets blockaded at Ferrol and Brest. On his return to European waters he inadvertently frustrated Napoleon's purpose of invading England by putting into Cadiz, where he was blockaded by Nelson. Full

of chagrin, he left Cadiz on October 19th, and two days later met Nelson off Cape Trafalgar. After his defeat in that battle he remained a prisoner in England for five months, and on his return to France committed suicide at Rennes on April 22nd, 1806.

Villi, numerous minute vascular projections from the mucous membrane of the intestine. They are found especially in the upper part of the small intestine, and in man are estimated at several millions.

Villiers, CHARLES PELHAM, statesman, brother of the fourth Earl of Clarendon, was born in London on January 3rd, 1802. He was educated at Haileybury and St. John's College, Cambridge, and called to the bar in 1827. He was returned for Wolverhampton in the Free Trade interest in 1835, and represented the town almost to the end of his long life. His annual resolution in favour of Free Trade was repeated until it was established. As President of the Poor Law Board (1859-66) he gave practical application to the doctrines of Adam Smith and Malthus. He died in London on January 16th, 1898.

Villiers, GEORGE. [BUCKINGHAM, DUKE OF.]

Villon, FRANÇOIS, poet, whose real name seems to have been François de Montcorbier, was born in Paris in 1431. According to his own account, he assumed, out of gratitude, the name of an ecclesiastical patron, Guillaume de Villon. Our knowledge of his life is derived mainly from allusions in his own writings. He appears to have passed a wild, reckless youth and, after his student days were over, to have been confirmed in his evil courses by killing a priest in a street brawl (1455). He was banished but pardoned next year on the ground that he only slew the priest in self-defence. Burglary was his special delight, and he was more than once condemned to death and pardoned. At the age of thirty he was already broken down by dissipation and the rigour of his life in prison. The date of his death is not definitely ascertained, but it is conjectured to have happened in 1461. His *Petit Testament* (1456) and *Grand Testament* (1461) are written in stanzas of eight octosyllabic lines. The note of these works and of most of his ballads is their modernity, realism and melancholy. As Rabelais said, "Où sont les neiges d'antan?" ("Where are the snows of yester-year?") was his chief concern.

Vincent de Paul, founder of the Congregation of Priests of the Mission, was born at Pouy, near Dax, France, on April 24th, 1576, and took holy orders in 1600. Captured by a Barbary pirate, he was sold into slavery in Tunis but, effecting his escape, returned to France in 1607. Through the Count of Joigny, in whose family he had been tutor, he became in 1619 Almoner-General of the Gallies, and devoted himself with wonderful success to the reformation of the criminals with whom he was brought into contact. In 1625 he set on foot the Congregation of Priests of the Mission, or Lazarists (so called from their establishment at the Priory of St. Lazare in Paris), a society designed to carry on

missions in country districts and foreign lands and to train young priests. He also established two founding hospitals at Paris and instituted the Society of St. Borromeo, the Filles de la Charité and other religious and charitable organisations. He died at St. Lazare on September 27th, 1660, and was canonised by Clement XII. in 1737. In many respects his philanthropic zeal anticipated the work of the Salvation Army.

Vincentines, a society for the relief and aid of the poor, was founded in Paris in 1833 and named in honour of Vincent de St. Paul. It has branches throughout all countries in which the Catholic Church has secured a foothold, and interprets its duties in a liberal spirit, establishing crèches for little children, dispensaries for the sick, libraries and labour bureaux, besides visiting the prisoner and raising funds to meet the distress caused by flood, famine, or other natural calamity.

Vine, the numerous species of the genus *Vitis*, the type of the polypetalous order Vitaceæ, of which *Vitis vinifera*, a native of Armenia, cultivated from immemorial antiquity in the Old World, is the chief, though four out of the ten North American species are also cultivated. They are woody, quick-growing plants, with scattered, palmately-lobed, stipulate leaves and branched tendrils. The inflorescence is a compound raceme of small, fragrant, greenish flowers, tetramerous or pentamerous and isostemonous. The petals cohere by their tips and fall off in little stars. The superior ovary is two-chambered and four-ovuled; but the nuculae resulting from it has, by abortion, generally only two seeds, whilst the cultivated varieties from which the sultana raisins and currants are obtained are seedless. Grape-stones are found in Swiss lake-dwellings of the Bronze Age, and in Egyptian mummies earlier than 1000 B.C. Besides the Biblical record of the making of wine by Noah, we have mention of it in Homer and of numerous varieties of grape in Virgil. It was probably introduced into France at the founding of Marseilles, about 540 B.C., and to the banks of the Rhine and to Britain by Roman agency. Tacitus's statement that the climate of the latter country was unsuitable to the vine implies an attempt at its culture, and vineyards are commonly mentioned in Early English records; but it is suggested that honey was added to make up for the want of sun to develop the sugar in the fruit. The limits of the successful cultivation of the vine lie between 36° and 48° N. (the northern limit being the southern extension of sugar-beet cultivation) and a similar zone in the southern hemisphere, the requisite summer temperature being about 67° F. The vine is, however, very amenable to artificial heat, its fruit being procurable in vineries at any season and almost in any country. From it we obtain fresh fruit, the dried raisins and currants already mentioned, wine, vinegar and brandy. Like other domesticated plants, the vine is subject to many destructive diseases. Over thirty insects attack it, of which by far the worst is the North American aphid (*Phylloxera vastatrix*), which was first detected in France in 1868, the

injury being done by sap-sucking parthenogenetic females which infest the root. Grafting American species of vine on European ones, or *vice versa*, has been tried as a preventive, but its chief result is to deteriorate the vine. The most successful treatment is a periodical submersion of the vineyards for six weeks at a time. Among various parasitic fungi that attack the vine the most destructive are the pyrenomycetous *Erysiphe* (*Oidium*) *Tuckeri*, *Sphaceloma ampelinum* and *Physalospora Bidwellii*. The *Erysiphe*, introduced from America about 1845, first attacks the young leaves. Flowers of sulphur is the most effective remedy. *Sphaceloma*, known as anthracnose, charbon, pech, or brenner, may be of Old World origin. It is treated with copper sulphate. *Physalospora* or black rot, which is similarly treated, is also apparently American.

Vinegar is a crude form of acetic acid obtained by the acetic fermentation of alcoholic liquors. It has been known from early times, and was an important reagent of the earlier alchemists. The acid obtained by the distillation of wood consists also of a crude acetic acid, but is known as pyroligneous acid, the term "vinegar" being usually restricted to the product obtained from alcohol. Various alcoholic liquors may be employed for its preparation, and the flavour, etc., of the final product varies with the liquor used. Wine, diluted spirits and beer are commonly employed, and are exposed to the air in vats, the temperature being kept at about 75° F. The time required for the fermentation varies, but may be taken as usually two or three weeks, and is hastened by allowing the liquor to trickle over beechwood shavings into vats below, and it is finally filtered and clarified. In the United Kingdom beer is chiefly used, and the product is known as malt vinegar. In France wine is commonly employed, white wines especially yielding a pure product. The strength of vinegar is usually estimated by the number of grains of sodium carbonate required to neutralise a fluid ounce. It is very largely employed in pickling, for culinary purposes, as a condiment, in stimulating perfumes, and also in pharmacy as an external stimulant.

Viol, a stringed musical instrument of the same type as the violin, which received its most characteristic form in the course of the 15th century. It bore a general resemblance to the guitar and the lute; but, unlike these instruments, it was played with a bow. Its chief features were a flat back, from five to seven strings tuned by fourths and thirds, a wide slender neck, and curves in the sides larger than those of the violin.

Viola, the tenor violin, somewhat larger than the ordinary violin. It has four gut strings, tuned in fifths, thus: A, D, G and C, the two lower strings being covered with silvered copper wire. Music for this instrument is commonly written in the alto clef.

Violet, the popular name for many species of the genus *Viola* which gives its name to the thalamifloral order Violaceæ. There are in all about

a hundred species of *Viola*, mostly natives of temperate regions, about a dozen being British; but this includes the pansies, which are not generally termed violets. The violets have rhizomes containing an emetic principle. They seldom reach the dimensions of undershrubs. The leaves are simple, stipulate and involute, and the flowers characteristically monosymmetric. The five sepals are auricled at the base: the lower of the five petals is spurred: the five stamens have very short filaments, connate introrse linear anthers, and broad appendiculate connectives, those of the two anterior ones having a tail-like nectar-secreting appendage enclosed within the corolla spur. The ovary is made up of three carpels, one-chambered, with numerous anatropous ovules on parietal placentas, and a terminal style, dilated above; and the fruit is a three-valved capsule with albuminous seeds. Many of the species have cleistogone flowers, as well as the conspicuous (chasmogamous) ones, the former producing most seed. The petals of the latter are commonly marked by finely-ruled honey-guides. *Viola odorata*, the sweet violet, is British, but is largely cultivated under many forms. Reddish, white and purple varieties occur wild, and the large, pale, double Neapolitan violet is merely a cultivated form. The sweet violet is the emblem of the Napoleonic dynasty. Scentless wild species are known as dog violets.

Violin (Italian, *violino*, diminutive of *viola*, "a viol"), the chief modern representative of the stringed instruments played with a bow. It consists of a hollow wooden chest, with curved belly and back, joined by sides or ribs, each of which has a peculiar indentation or bend half-way in the length; a neck or finger-board, extending some distance down the belly; and four strings attached to a tail-piece at the bottom of the chest and kept in position and tune by pegs or turning-pins at the upper extremity of the neck. Rather more than half-way down the belly the strings are raised by a bridge of convex outline, so that the bow comes into contact with each separately without disturbing the others. A sound-post between back and belly gives support to the bridge at the point of greatest tension. On the surface of the belly, on either side of the bridge, there are two sound-holes of the form *f* or *f*. The strings, which are of gut, the lowest being covered with silvered copper wire, are tuned in fifths, thus: E, A, D and G (next below middle C). Whilst playing, the violinist keeps his instrument in a nearly horizontal position by means of the left arm, the lower part of the chest resting on his left collar-bone. The bow, which is made of horsehair charged with rosin, is held in the right hand. The compass is raised through eleven different positions from two octaves and a major third to nearly four octaves. The pitch of the tones is regulated by "stopping" the strings—i.e., pressing them with the fingers of the left hand against the finger-board, so as to shorten the vibrating portion. Harmonics are produced by touching the strings lightly. Owing to its wide range of expression, the violin is the most important instrument in the modern orchestra.

Violins were first constructed by the Milanese in the latter part of the 16th century. The form of the instrument was finally determined a hundred years later by Antonio Stradivari (1649-1737) of Cremona.

Violoncello (diminutive of Italian *violone*, the augmentative of *viola*), an instrument of the viol class, held by the player between his knees. It occupies an intermediate position between the viola and the double-bass. Its size is about twice that of the violin. There are four gut strings, tuned in fifths thus: A, D, G, C, the third and fourth being covered with silvered copper wire.

Viper, any individual of the genus *Vipera* (= *Pelias*), type of a family (*Viperidae*) of venomous snakes widely distributed in the Eastern Hemisphere and most abundant in Africa. The head is broad, and the tail short as compared with the body. There is a large, perforated, erectile fang in each jaw, with others in reserve behind. The Common Viper (*V. berus*), the only British venomous reptile, is more abundant in Scotland than in



VIPER.

England. It is doubtful if its bite has ever proved fatal to an adult in good health, though children and persons of weak constitution have been killed by it. Cherry Kearton, whilst tramping the moors with a gamekeeper, was fortunate enough to come across an adder basking in the sunshine and, being equipped with his camera, succeeded in taking the creature's photograph, as recorded in Richard Kearton's popular book, *With Nature and a Camera*. The viper may be readily distinguished from the Common Ringed Snake by its bold dark markings, and especially by those on the head. These never vary, but the ground-colour may be olive-brown or nearly black. There are two or three varieties. The length of an adult is about two feet. The viper never attacks unless provoked or disturbed. The Asp belongs to the same genus. The African and Indian species are very venomous. [CERASTES.]

Virchow, RUDOLF, pathologist and politician, was born at Schivelbein, Pomerania, Germany, on October 13th, 1821, and studied medicine at Berlin, where, in 1847, he founded, along with Reinhardt, the *Archiv für pathologische Anatomie und Physiologie*. Owing to his sympathy with the Revolution of 1848 he left Berlin and went to Würzburg, where he held the chair of Pathological Anatomy until 1856, when he was summoned back to the capital to fill a similar post in the Berlin medical school. Henceforth his career was a shining example of

industry. He created the study of modern pathology, investigated epidemics, established hygiene and sanitation on a scientific basis, and reformed hospitals, asylums and other institutions. He was an enthusiastic anthropologist and became an authority on prehistoric man and the lake dwellings. He was an ardent and active Liberal, and was elected to the Prussian Lower House in 1862 and in 1880 to the Reichstag, where he led the Opposition against Prince Bismarck. Of many works on various subjects it will suffice to name his *Cellulärpathologie* (1858), *Die Krankhaften Geschwülste* (1863-7), and *Handbuch der Speziellen Pathologie und Therapie* (1854-62), in addition to his editing of the *Zeitschrift für Ethnologie*. He died in Berlin on September 5th, 1902.

Virgil (PUBLIUS VIRGILIUS MARO), the greatest of Roman poets, was born on his father's farm beside the Mincio in the district of Andes, near Mantua, Italy, on October 15th, 70 B.C. He was educated at Cremona and Milan, and in his nineteenth year proceeded to Rome, where he applied himself to rhetoric and studied philosophy under Siron the Epicurean. In 42 B.C. his father's farm was absorbed into one of the colonies established for the disbanded soldiers of Octavianus, and although the influence of Asinius Pollio enabled him to secure its temporary restitution, he was expelled by the new proprietors, and after a short residence in Siron's villa settled in Rome. Here he soon gained the friendship of Horace, Varus and Gallus, and became one of the brilliant band of men of letters who gathered round Mæcenas. In 37 appeared a collection of ten *Eclagues*, or pastorals, one of the three great poems on which his fame rests. Although both in manner and matter they betray a more or less close imitation of Theocritus, they were hailed with enthusiasm, for they showed that the Latin language possessed an unsuspected capacity of giving beautiful expression to the tender and refined sentiments of the poet. Soon after their publication he withdrew to Campania, where the patronage of Mæcenas placed him beyond the fear of poverty. Here, either in his villa at Naples or his country house near Nola, he passed seven years of peaceful retirement, engaged in the composition of the *Georgics*, a poem in four books on the art of husbandry, which was published in 30. The remaining years of Virgil's life were devoted to the *Æneid*, an epic poem in twelve books describing the fall of Troy, the wanderings of Æneas, and the foundation of the kingdom in which tradition saw the germ of the Roman Empire. It was not destined to receive the final revision of its author, who, after a life of constant ill-health, died at Brundisium on September 21st, 19 B.C., on his return from a visit to Athens. The *Culex*, *Morctum*, *Copa* and a few other short pieces of no great value are also ascribed to Virgil.

Virginia, one of the founder states of the American Union, occupies an area of 42,450 square miles, and is bounded on the N. and N.E. by Maryland, on the E. by the estuary of the Potomac, Chesapeake Bay and the Atlantic, on the S. by North Carolina and Tennessee, and on the W. by

Kentucky and West Virginia. Until the War of Secession of 1861-5 Virginia (which joined the Confederates) and West Virginia (the tract in the north-west which remained loyal) formed one state (the constitution having been ratified in 1788), which had grown out of the earliest British settlement on the continent, and was named by its founder, Sir Walter Raleigh, in honour of Elizabeth, the "Virgin Queen." During the Civil War Virginia suffered from military operations more than any other state. The Appalachian or Alleghany range (1,000 to 6,000 feet), running north-east to south-west, roughly divides the two portions, and throws out lateral spurs, enclosing rich valleys, which yield the finest cotton and tobacco, with wheat, maize, oats, hay, potatoes and many other temperate and subtropical products, and afford fine pasturage for large numbers of sheep, cattle and swine. The country is well watered by the Potomac, Pamunkey, Appomattox, York, James, Rapidan, Onondaga, Shenandoah, Roanoke and other rivers, whilst the coast abounds with fish, and with its many inlets offers excellent facilities for trade. Miasmatic districts are found on the coast, e.g., the Great Dismal Swamp. Gold, iron, copper, manganese, lead, zinc, coal, marble and gypsum are among the mineral resources. The manufactures include tobacco (the Virginian leaf is universally esteemed for its flavour), cotton, iron, leather, paper, agricultural implements and machinery, vehicles, locomotives, wines and spirits, canned fruit, flour and lumber. Lumbering in all its branches is vigorously pursued. Richmond (85,060), on the James, is the capital. Pop. (1900), 1,854,184.

Virginian Creeper, or AMERICAN IVY (*Ampelopsis hederacea*), a beautiful shrubby climbing plant belonging to the vine family and closely allied to the genera *Vitis* and *Cissus*. It is a native of Virginia, but grows luxuriantly in the United Kingdom. Its leaves are quinate, whence it is sometimes known as "five fingers." They turn a brilliant crimson in the autumn. The plant produces branched tendrils, ending in remarkable haptera or adhesive discs. The flowers are small, yellowish and paniculately clustered. An allied species (*A. tricuspidata*), known in nursery gardens as *A. Veitchii*, has simple leaves, sometimes trilobed, and a closer growth against walls.

Virginian Quail (*Ortyx virginianus*), one of the American Partridges belonging to the subfamily *Perdicinae* of the family *Tetraonidae* of the order *Gallinæ*, or Game Birds. It ranges from Canada to the Gulf of Mexico. It is often called "Bob-White," from its note.

Viscacha, or BISCACHA (*Lagostomus trichodactylus*), a nocturnal burrowing rodent of the Chinchilla family, living in communities of from twenty to thirty between the Uruguay River and the Rio Negro in South America. An adult male is nearly two feet long; the general hue is grey, the face is white, with two black bands. Its haunts are shared by the Burrowing Owl, much to the owner's disgust, for the bird's habits are not sufficiently cleanly to satisfy the unwilling host.

The Viscacha has the singular propensity of ejecting from its dwelling all kinds of hard substances. Charles Darwin mentioned that to this habit a traveller owed the recovery of a watch, which he had dropped while riding across the pampas. By the simple precaution of examining the mouth of every burrow on his line of road he ultimately found the lost watch.

Viscosity is the resistance offered by one layer of a fluid to the passage of another layer over it. Thus, if we stir a liquid it soon comes to rest, the motion having been frittered down to heat, and if a liquid flows over a boundary the upper layer moves fastest, the velocity being less and less the deeper we go. Viscosity may thus be considered as friction between the particles of a fluid. A fluid is considered more perfect in proportion as it has less viscosity. Cobbler's wax, pitch and marine glue are thus exceedingly imperfect fluids, and to the casual observer they might appear to be solids; but it is a well-known fact that a lump of any of them, if left to itself, will slowly spread out into a thin layer; it will, in fact, flow, and the capability of flowing is the distinctive property of a liquid. Treacle is another example of a viscous fluid, while ordinary paint, thin syrup, water and petroleum spirit are liquids of less and less viscosity. Metals under sufficient pressure can be induced to flow like liquids, as is exemplified in the drawing of wire and squirting of lead tube, and in these circumstances they exhibit varying degrees of viscosity.

Vishnu ("PRESERVER"), the second deity in the Hindu triad. At first regarded as god of the sun, he was afterwards exalted to a supreme position by endowing him with the attributes of many other gods. The purpose of his incarnations (avatars), in which he has assumed the shape of various animals, has ever been the welfare of mankind.

Vision. The construction of the eye is such that a pencil of rays is refracted in it and becomes more convergent; thus a real inverted image is formed near or on the retina. The object emitting the rays will be clearly seen by the possessor of the eye when the image is sharply defined on the retina. An ordinary eye is able to adapt itself, by altering the focus of its crystalline lens, so that it can see objects at any distance with ease. Near-sighted people can, however, not manage to see distant objects however they may try to adjust their eyes. Artificial means have, therefore, to be adopted to decrease the convexity of the natural lens, and spectacles, adding their effect to that of the refracting media in the eye, produce an image on the retina of a far-off object. The opposite compensation is made for long-sighted people. The advantage of having two eyes instead of one is that we are enabled up to a short distance to judge of solidity, the effect being similar to that produced by the stereoscope. Since each eye is directed towards an object, the angle between their optic axes will vary with its distance: this gives us a means of estimating distances, while a further guide to the same is obtained by an alteration in the position of

the observer, who notices the change in the relative positions of two objects nearly in the same straight line with himself.

Vistula (German, WEICHSEL), a river of Central Europe, which takes its rise in the northern face of the Carpathians in Austrian Silesia, at a height of 3,600 feet above the level of the sea, and after a northerly course of 650 miles falls into the Baltic near Danzig by three mouths. It traverses Galicia, Russian Poland and Prussia, receiving on the right the Dunajec, San, Wieprz, Bug and Drewenz, and on the left the Pilica, Bzura, and Brahe. Cracow, Warsaw, Plock, Thorn, Kulm and Graudenz are on its banks. It is navigable by large vessels as far up as the confluence of the San, and to Cracow by small craft.

Vitreous Rocks closely resemble artificial glass or slag in composition, texture and other characters, having, like those substances, undoubtedly resulted from comparatively rapid cooling from a state of fusion. They often exhibit a streakiness known as fluxion-structure; or, from contraction in cooling, are divided up by crossing cracks and concentric shells known as perlitic structure, from a resemblance to pearls; or contain gas cavities or bubbles, when they are known as scoriaceous, or pumiceous. When these cavities are filled in with some lighter-coloured mineral the rock is termed an amygdaloid. Under the microscope vitreous rocks sometimes exhibit spherical clusters of radiating fibres known as spherulites. In almost all cases they contain scattered enclosures, which are either crystals that have resisted fusion, or crystallites, or globules of imprisoned gas, or cavities containing liquid, chiefly water, but not filled by it, thus leaving a bubble. The principal vitreous rocks are obsidian; pitchstone; perlite, an opaque, perlitic, enamel-like, felspathic glass; pumice, a vesicular glass, varying widely in composition and colour, and tachylite, the glassy coating of basalt flows. [BASALT.] By the increasing development of enclosures, vitreous rocks pass into semicrystalline ones; obsidian into trachyte; tachylite into basalt, etc. They are then said to be devitrified.

Vitriols. A number of compounds are known as vitriols, all of which are derived from sulphuric acid, which was formerly (and still is) known under the name of oil of vitriol or simply vitriol. The iron salt, a ferrous sulphate, is a green salt which forms monoclinic crystals containing 7 molecules of water. It is known commercially as copperas or green vitriol, and sulphuric acid owes its commercial name to its former preparation from this source. Blue vitriol consists of the sulphate of copper, CuSO_4 , which crystallises with 5 molecules of water and forms large blue triclinic crystals. When heated the water is expelled and the copper sulphate remains as a white powder of use as a drying agent. The white vitriol of commerce is composed chemically of sulphate of zinc, ZnSO_4 , and like green vitriol crystallises with 7 molecules of water. All four compounds are largely used in many industrial processes; indeed, oil of vitriol is of some use

directly or indirectly in almost all. Green vitriol is utilised in the manufacture of ink, in dyeing, and is useful in the chemical laboratory; blue vitriol also is a commonly employed reagent, and is much used for the destruction of phylloxera, while white vitriol finds application in dyeing, calico-printing and medicine.

Vizier (Arabic, *Wazir*, "burden-bearer"), a title conferred in the 8th century on the chief minister of the first of the Abassid Caliphs, and afterwards borrowed from the Saracens by the Persians, Turks and other Eastern peoples. The famous Barmecides were one of the earliest lines of viziers. In the Ottoman Empire the title was ultimately given to the heads of all the ministerial departments comprised in the divan, and likewise to provincial governors, the president of the divan being distinguished as *vézir-agam* (grand vizier), but the latter designation is now obsolete.

Vladivostok, a naval station, on Peter the Great (also called Victoria) Bay, the Maritime Province, Siberia, Russia-in-Asia. Founded in 1861 it is finely situated amidst timber-clad hills, and possesses one of the most capacious harbours in the world, though ice-bound for three months. It is the terminus of a branch of the Trans-Siberian Railway, connecting with the main line at Harbin. There are saw and flour mills, and brickfields, besides brewing, distilling and engineering. Pop. (1901), 38,000.

Voguls, a Finnish people, a branch of the eastern or Ugrian group, closely allied to the Ostyaks, and with them formerly collectively known as Manzi. They occupy the eastern slopes of the Ural Mountains north of Ekaterinburg, and especially the valley of the River Konda. The Voguls have been nominal Christians since the beginning of the 18th century, but still practise numerous Shamanist rites. Many have become assimilated to the Russians in dress and social habits, and not more than 30,000 are still of Finno-Ugrian speech.

Volapük. [UNIVERSAL LANGUAGE.]

Volatile Oils are a class of compounds obtained usually from vegetable sources by extraction with solvents or by distillation with or without the addition of water. They are generally capable of being distilled without undergoing decomposition. In their characters they vary considerably. They are mostly colourless if pure, but have usually a slight yellow tint. They do not show the viscosity of ordinary oils, but run freely, and though miscible with alcohol, benzene, etc., are insoluble in water. A large number consist of ethereal salts of organic acids, and are very largely employed as flavouring agents and in perfumery and medicine. Examples of such are oil of cloves, essence of pears, etc. Others consist almost entirely of hydrocarbons, usually of the benzene or aromatic series, as oil of turpentine, oil of thyme. The rest are distributed amongst a large class of compounds, as the aldehydes (oil of bitter almonds), phenols and the sulpho-compounds, which are usually characterised by a strong, disagreeable and suffocating odour,

the best-known of such compounds being ordinary mustard oil. [OILS.]

Volcano, a mountain originally of conical form, its slope, in whatever part of the world it occurs, being a similar curve, formed by the accumulation of fragmentary and molten rocks [TUFF, LAVA] ejected by the force of internal heat. Volcanoes commonly occur in mountain-chains near the sea, in some cases noticeably forming lines in connection with the great ocean-basins. In size they vary from mere mounds a few yards in diameter, such as the salses or mud-volcanoes near the Caspian to Etna, 10,874 feet high, with a base 30 miles in diameter; Cotopaxi, in the Andes, 18,887 feet high; or Mauna Loa, in the Sandwich Isles, 13,700 feet high, with a base 70 miles in diameter and two craters, one of which, Kilauea, is the largest active crater on the globe, being 7 miles in circuit. [CRATER.] Though the first formation of a volcano has seldom been witnessed, it would seem that it is marked by earthquake movements, followed by the opening of a rent or fissure, but with no such tilting up of the rocks as was once supposed to take place. From this fissure large volumes of steam issue, accompanied by hydrogen, nitrogen, carbon dioxide, hydrochloric acid and sulphur dioxide. The hydrogen, apparently derived from the dissociation of water at a high temperature, flashes explosively into union with atmospheric oxygen, and, having exerted its explosive force, the steam condenses into cloud, heavy masses of which overhang the volcano, pouring down copious rains. This naturally disturbs the electrical condition of the atmosphere, so that thunder and lightning are frequent accompaniments of an eruption. The hydrochloric acid probably points to the agency of sea-water. Besides the gases just mentioned, sulphuretted hydrogen, ammonia and common salt occur, but mainly as secondary products formed by the union of the vapours issuing from the volcano, and commonly seen also in the vapours rising from cool lava streams or dormant volcanic districts. It is important to notice that the vapours issue from the volcano spasmodically, explosions succeeding each other with great rapidity and noise. All substances thrown out by the volcano, whether gaseous, liquid, or solid, are conveniently united under the term *ejectamenta*, and all of them are in an intensely heated, if not in an incandescent, state. Most of the gases are incombustible, but those containing sulphur and hydrogen burn with a blue flame, rendered perhaps more visible by the presence of solid particles. Much of the so-called flame, however, in popular descriptions of eruptions, is an error of observation due to the red-hot solid particles and the reflection of the glowing orifice on the overhanging clouds. Solid bodies are thrown into the air with enormous force and to proportionally great heights, those not projected vertically falling in consequence at considerable distances from the volcano. It is the explosive force from below which keeps the crater clear as a cup-shaped hollow truncating the cone, and all stones falling into it would only be thrown out again. It

may, at the close of an eruption, cool down so completely that a lake may form within it, such as Lake Averno, near Naples; or it may long remain a seething sea of lava, such as Kilauea; or the lava may find one or more outlets from it, either by welling over its rim, which it will then generally break down (as in many of the small extinct volcanoes—"puys"—of Auvergne in Central France), or more usually by bursting through the sides of the cone. It is not generally until the volcano has exhausted its first explosive force that lava begins to issue. Several streams may issue in different directions. Their dimensions are sometimes enormous. Lava varies much in liquidity, and in the rate at which it flows. This depends much, however, on the slope it has to traverse. Glowing at first as a white-hot liquid, the lava soon cools at the surface to red, and then to black; cinder-like, scoriaceous masses form on its surface and in front of the slowly-advancing mass; clouds of steam and other vapour rise from it, and little cones are thrown up from its surface; but many years may elapse before the mass is cooled through. Thus, while the surface is glassy, the interior becomes crystalline. The dark glass-like lava, abundant in Mexico, where the ancient inhabitants used it for knives, is known as obsidian; the froth or scum of the stream, filled with gas-cavities, as pumice. As the temperature of the volcano falls hydrogen ceases to be given off, but nitrogen and carbon dioxide increase in quantity. Fumaroles, or smoking vents, both in the crater and on lava-streams, emit these gases, sometimes long after an eruption, together with alkaline compounds of soda, potash, lime and sulphur, or, as the temperature falls, with acids. Fumaroles rich in sulphur, which they often deposit in crystals, are known as solfataras, and in Tuscany jets, known as *soffioni*, give off steam and boracic acid, the heat of the former being economically employed to concentrate the latter. Bright-coloured chlorides, sulphate of lime, alum and other minerals encrust the crater as it cools.

Vole, any species of the genus *Arvicola*. There are about forty species of these mouse-like rodents, widely distributed over Europe, Asia and North America. Three occur in the United Kingdom: the Water Vole (*A. amphibius*), often misnamed the water-rat, with dark brown fur; the Field Vole (*A. agrestis*), or short-tailed field-mouse, clothed in brownish-grey; and the Bank Vole (*A. glareolus*), with rusty-brown fur. The last two are about the size of mice, but more stoutly built. They feed chiefly on vegetable substances. Within recent years they have multiplied in the north of England, Scotland and in Greece to such an extent as to become a plague. This increase is probably due to the somewhat wanton or at least excessive destruction by gamekeepers of hawks, owls, weasels and other animals of prey.

Volga, a river of European Russia, which rises in the Valdai Hills and, flowing with many windings to the east as far as Kazan, there turns southwards and, after a course of 2,300 miles, enters the Caspian Sea below Astrakhan by many mouths. Its drainage area covers 563,000 square miles. It

is navigable throughout almost all its length, and by means of affluents (on the right, the Oka, Sura and Sarpa; on the left, the Tvertsa, Mologa, Sheksna, Kostroma, Unsha, Vetluga, Kama and Samara) and canals communicates with every part of Western Russia. The towns of Iver, Yaroslavl, Nijni-Novgorod and Saratov are on its banks. Fish abound in its waters, especially the sturgeon and salmon.

Volsungs, a family in the ancient Teutonic mythology, whose story is the theme of the Icelandic *Volsunga Saga*, a work of the 12th century. Siegfried, in the *Nibelungenlied*, belonged to the same race.

Volt, in electricity, is the practical unit of electromotive force, difference of potential, or electric pressure. It is the pressure needed to force a current of one ampère through a resistance of one ohm, and is 10^8 C.G.S. units of potential. The most commonly used standard of pressure is the Clark cell, which has been found, when set up in a definite way, to give a definite difference of potential, which, however, varies with the temperature, and is equal to $1.438 [1 - 0.00077 (t - 15^\circ)]$ legal volts, where t is the temperature in degrees Centigrade.

Volta, ALESSANDRO, physicist, was born at Como, Italy, on February 18th, 1745. As a youth he exhibited a strong bent towards science, and in 1774 became Professor of Physics in the gymnasium of Como. Five years later he was appointed to the newly-founded chair on the same subject in Pavia University, which he resigned in 1804. In 1815 the Emperor of Austria made him Director of Philosophy in the University of Padua, and he died at Como on March 5th, 1827. His researches in the field of electricity were of first-rate importance. He invented several appliances, such as the electrophorus, electroscope and electrometer, discovered the means of producing an electric current through chemical action on one of two united plates of different metals, and formulated the law governing difference of potential.

Voltaire, FRANÇOIS MARIE AROUET DE, poet, dramatist, historian and philosopher, was the son of François Arouet, a notary at Paris, where Voltaire was born on November 21st, 1694. The letters written during his school-days at the Jesuit College of Louis le Grand already show an innate tendency to scepticism. His repugnance to the legal profession was a great disappointment to his father, who, in order to divert his mind from the dissipation of Paris, sent him in the suite of the Marquis de Châteauneuf to The Hague; but here he formed an attachment to a Protestant which occasioned his recall (1713). In consequence of some lampoons on the Duc d'Orléans, he was imprisoned for eleven months in the Bastille (1717-18). On his release he assumed the additional name of Voltaire, an anagram of Arouet l. j. (le jeune). In the course of the same year his first tragedy, *Edipe*, was acted with great success at the Théâtre Français. A fracas at the house of the Duc de Sully led to his banishment to England

in May, 1726. During his stay in that country, which lasted three years, he won the favour of Queen Caroline, and made many friends in the worlds of politics and letters. Among these Bolingbroke seems to have exercised the most enduring influence on his mind. The *Henriade* (which had already appeared secretly at Rouen in 1723 under the title of *La Ligue*) was now published in London



VOLTAIRE.
(By Largillière.)

with a dedication to the queen (1728). After his return to France he acquired much money by prudent speculations, and in 1731 printed his *Charles XII.*, which he had written in England, and in 1732 he produced *Zaire*, one of his best plays. His *Lettres Philosophiques sur les Anglais* (1733) gave great offence, and to escape prosecution Voltaire took

refuge with his friend, Madame du Châtelet, at the Château of Cirey (1734). Here he spent the greater part of the five following years, producing amongst other work the drama of *Mérope* (first acted in 1743) and much of the *Siècle de Louis Quatorze*, and devoting much time to the study of natural science. Having the good fortune to commend himself to Madame de Pompadour, he was restored to favour at Court, and in 1745 received the appointment of historiographer royal, being elected to the Academy next year. In consequence of fresh rebuffs he betook himself, with Madame du Châtelet, to the court of Stanislaus, ex-King of Poland, at Lunéville (1748), and after her death (1749) accepted a long-neglected invitation of Frederick II. to take up his abode at Berlin (1751). Voltaire quarrelled with his patron before three years were over, and was glad to find an opportunity of escaping from his court. To the first five years of his sojourn in Switzerland belong *Les Mœurs et l'Esprit des Nations*, the poem on the earthquake at Lisbon (1756), and the novel of *Candide* (1759). His exertions on behalf of Calas should be remembered to his honour. In 1762 appeared the first edition sanctioned by Voltaire of *La Pucelle d'Orléans*, although copies in various degrees of completeness had been in circulation since 1735. In 1778 he went to Paris to witness the performance of his tragedy, *Irène*, but the excitement was too much for the feeble old man, and his excessive use of opiates brought on an illness which ended in death on the 30th of May in that year.

Volume is measured in terms of some convenient unit of volume, and the best unit of volume to choose is the cube of the unit of length. The cubic foot is, however, little used in the United Kingdom commercially, gas being one of the few things which are measured in this way; in most other cases a perfectly arbitrary unit is selected, such as the gallon or bushel. The volume of a rectangular body is obtained by multiplying its length, height and breadth; that of a sphere is $\frac{4}{3} \pi r^3$, where r is the radius and π is the ratio between the circumference and diameter ($\pi = 3.1416$ nearly). The volume of a right cylinder is found by multiplying its height by π times the square of its radius, and that of a cone is one-third the volume of the cylinder on the same base, and of the same height. Most substances alter their volume on changing their state. Ice occupies a greater volume than the water which produces it, hence the bursting of water-pipes in a frost. Solid cast-iron also occupies a greater volume than the molten metal, hence, as it cools, it thrusts itself into every part of the mould. It is this property which makes it so important, most other metals contracting during solidification, and so being useless in casting.

Volumetric Analysis is a method of quantitative analysis in which substances are estimated by the volume of some standard solution required to complete some reaction. The close of the reaction is usually known by adding what is called an indicator. Thus, if the quantity of an acid is to be determined, a little litmus solution may be added as indicator, and the acid neutralised by the addition of a standard solution of soda. As soon as the neutralisation is complete, the further addition of a drop of soda changes the colour from red to blue, and hence by the volume of soda required just to turn the liquid blue the quantity of acid present is known. A very large number of methods are available in volumetric analysis which, where available, usually possess the advantage of speed and the capability of making several consecutive determinations.

Volunteers, citizens who place their services at the disposal of the State for military purposes without demanding any payment in return. The oldest body of this kind in England, the Honourable Artillery Company of London, is identical with the Guild of St. George, which received a charter from Henry VIII. in 1537. The first regular organisation of volunteer corps throughout the country took place in 1794, when a French invasion seemed imminent. On the renewal of war in 1803 the Military Service Bill was passed, providing for the enrolment of all able-bodied men as volunteers. By 1805 the total number (including those raised in Ireland) had risen to more than 400,000, but when peace was concluded they were all disbanded with the exception of the yeomanry or volunteer cavalry, which still survives. No further effort was made to raise an efficient volunteer force till 1859, when Great Britain was roused to a sense of her danger by the threatening attitude of the French press. The Government, convinced of the desir-

ability of keeping up the force, determined to defray this and other expenses by means of an annual capitation grant out of the public funds (1862). At the same time a higher standard of military proficiency was required. In 1870 an Act was passed transferring the immediate authority over the volunteers from the lords-lieutenant to the Crown. The result was that they were brought under the direct control of the War Office and drawn into much closer relations with the regular army. In 1901 new regulations were introduced with the object of ensuring a higher level of military training, and further innovations appeared in the Army Act of 1907. The mimicry of the regular force, however, had been carried by this date to an extent that seriously impaired the popularity of the volunteers both amongst the men themselves and possible recruits.

Volutidae, a family of Gasteropoda, including many of the largest and most highly coloured of univalve mollusca. The shell is generally of a turret shape, has a long mouth, notched at the lower end. The type-genus *Voluta* began in the Cretaceous system, but this and the other members of the family, such as *Intra* and *Marginella*, are most characteristic of the Tertiary period. They are all marine.

Volvox, a genus of fresh-water algae. It has a spherical cœnobium of a pale green colour, which is constantly rotating and changing place.

Vomiting, a symptom met with in disease under a great variety of conditions. It may occur as the result of the ingestion of poisonous or irritant substances, or as the result of poisonous principles developed in the course of certain diseases and circulating in the blood. Thus vomiting is a common symptom of the onset of many forms of acute disease. It is again due to a number of morbid conditions affecting the stomach, and it may result from reflex nervous action, as, for example, in hepatic and renal colic, in strangulated hernia, and in disease of the pelvic organs. Again vomiting may occur in the case of disease affecting the central nervous system. Its treatment will be involved in that of the disease of which it is a symptom. (For the vomiting of blood, see HÆMATEMESIS.)

Vortex. Simple circular vortex rings may be produced by filling a box with smoke, making a round hole in one side of it, and replacing the opposite side with a stretched membrane or a cloth. A succession of blows on the cloth causes a succession of circular smoke-rings to emerge from the hole. The same thing is often obtained when a gun or mortar is fired, or when a man exhales tobacco smoke in a particular way. The properties of such rings were first deduced by Helmholtz, and upon these Lord Kelvin has based a theory of the structure of matter. It is noticed that if two smoke-rings are following one another, the front one opens out and moves more slowly, while the ring behind contracts and increases its speed till it finally passes through the other; it in turn then opens out, and the two rings alternately pass through each

other. If two rings are moving towards each other, both open out and move more slowly, never actually reaching each other. A vortex smoke-ring contains, besides the visible smoke, an amount of rotating air, and as the ring moves onwards it consists of the same air and smoke all the time. This air then has become differentiated from the rest of the atmosphere, and moves through it as though it were a ring of metal. Helmholtz showed that in a perfect fluid—one in which fluid friction did not exist—the vortex ring would go on moving for ever. But if the air had been a perfect fluid we could not have started the vortex ring at all. The vortex ring of a perfect fluid is therefore uncreatable and indestructible. Lord Kelvin supposed that the universe might be filled with a perfect fluid, in which vortex filaments of different shapes, having once been started, would go on for ever; hence these vortex filaments might be considered as the fundamental atoms of matter which we cannot destroy or create. Helmholtz further proved that vortex filaments in a perfect fluid must be either endless—i.e., ring-shaped, though the ring may be twisted in a multitude of ways—or the ends must be in the surface of a liquid. We can get examples of the latter by moving a teaspoon rapidly through a cup of tea, the bowl of the spoon being only half in the liquid. The two little eddies observed are the ends of half a vortex ring. In Lord Kelvin's infinite fluid there can be, of course, no ends, so all atoms on this hypothesis must be closed vortex rings. Helmholtz showed that a vortex ring cannot be cut; a sharp knife may be brought up to it, but the ring gets out of its way. In this, again, it is like an atom; it is indivisible.

Vorticella. [BELL-ANIMALCULE.]

Vosges (German, *VOGesen*), a chain of mountains which begins in the departments of Haute-Saône and Haut-Rhin, France, and skirting Belgium, ends near Mainz on the Rhine, being connected by subsidiary spurs with the Côte d'Or and Cevennes at the southern end, and the Ardennes at the northern. The form of the hills is often rounded—hence their French name of *Ballons*—and their highest elevation is under 5,000 feet. They are thickly wooded and shelter wolves and wild boars. The Saône, Moselle, Meuse, Marne and Aube have their origin here, and the mineral resources are considerable, rock-salt being the most valuable commercially. In many parts they are luxuriantly clad with pine, beech and other trees, while their lower slopes are frequently covered with vines.

Vosges, a department of France, taking its name from the foregoing range, bounded on the N. by Meurthe-et-Moselle, on the E. by Alsace-Lorraine, on the S. by Haute-Saône, on W. by Haute-Marne and on the N.W. by Meuse. It has an area of 2,303 square miles, mostly mountainous and wooded, but to the north and north-west there extends a fertile plain, where wheat, barley, oats, rye, potatoes, beetroot, grapes, white hemp and flax are grown, and where dairy-farming prospers. The live-stock includes a small but strong breed of horses, sheep, cattle, dogs, goats, swine and poultry.

Black cherries are cultivated in great quantities for the distillation of Kirschwasser. Iron, copper, silver and marble are profitably worked. The manufactures comprise textiles, iron and steel, glass and paper. Épinal (28,080) is the capital, and among other towns may be named Plombières (famed for mineral waters), Remiremont, St. Dié and Neufchâteau. Pop. (1901), 421,104.

Vulcan, the Old Roman fire-god, afterwards identified with the Greek Hephestos (q.v.).

Vulcan. The motions of the planet Mercury have always been somewhat different from those deduced by calculation. In 1859 Leverrier, after a careful examination of the details of all the transits of this planet, found that the perihelion of Mercury's orbit moves 38" in a century more than can be accounted for by the action of the other planets. This, he said, could be explained by supposing an undiscovered planet to exist between Mercury and the sun. Immediately an announcement came from Dr. Lescarbault, a physician of Orgères, that he had actually observed such a planet about six months previously. Leverrier hastened to see him and, convinced of the accuracy of the observation, named the new planet Vulcan, calculating for it, further, a period of revolution rather over nineteen days. Vulcan, however, was seen no more. In 1876 Weber announced its transit, but the supposed planet was found to be only a sunspot. From other imagined appearances Leverrier calculated that he should be seen in transit on March 22nd, 1877, and again in 1882. Search, however, did not reveal him, and his supposed appearance in the total eclipse of July 29th, 1878, was probably due to a mistaken estimation of certain stars. Belief in Vulcan has consequently waned, and the peculiarity of Mercury's movements remains unexplained.

Vulcanite, a substance prepared by the union of caoutchouc with about half its weight of sulphur. If the proportion of sulphur is less than this, the product is generally known as vulcanised caoutchouc. The union is effected by thoroughly incorporating the caoutchouc and flowers of sulphur by kneading them together on warm rollers and maintaining for about six hours a temperature of from 270° to 350° F. Small articles of caoutchouc may also be vulcanised by immersing them in a mixture of carbon disulphide and chloride of sulphur, and allowing the liquid to evaporate at an ordinary warm temperature (75° to 80° F.). Vulcanite is used in the manufacture of brooches, bracelets, combs and other ornaments, and in the construction of electrical machines.

Vulgate, the Latin version of the Bible, translated by St. Jerome at the close of the 4th century and completed in 405. It is said to have been the first book printed (about 1455).

Vulture, a bird belonging to the Raptorial family Vulturidæ, chiefly from subtropical and tropical regions of both hemispheres. They are large birds, of repulsive habits, but fulfil an important duty as scavengers by clearing away carrion and garbage. The head and neck are

generally bare, or covered with scattered tufts of down; the feet are large and well fitted for walking, but the claws are weak, and this fact prevents them from grasping and carrying off living prey. They feed their young by bringing up the contents of the crop. The American vultures differ from those of the Old World in having no bony partition between the nostrils. The chief species are the Black Vulture (*Vultur monachus*) and the Griffon (*V. fulvus*), which are found in Southern Europe, the Eared Vulture (*Otomyops auricularis*) from Africa, the Indian Vulture (*O. calvus*), and the Egyptian Vulture (*Nephron percnopterus*). [CONDOR. LÄMMERGEIER.]

W

W, the twenty-third letter of the English alphabet. It does not occur in the alphabets of the Greeks, Romans and French, amongst great literary peoples. It is, as its pronunciation suggests, actually the double u. This is seen in ancient MSS., in which the capital V V by ligature became W, and the medials were u u. Though usually a consonant it has occasionally, as in "few," the value of a vowel.

Wace, MASTER (1120-80), trouvère (often without any authority called "Robert Wace"). Born in Jersey, he was the author of two metrical chronicles, *Le Roman du Bret*, apparently a paraphrase of Geoffrey of Monmouth's *History*, and *Le Roman de Rou*, which records the fortunes of the Norman dukes from Hrolf, or Rou, down to 1106.

Wafers, thin brittle discs of dried paste, usually made of flour and water, which, in the case of coloured wafers, are mixed with non-poisonous colouring matter. They were formerly used as a ground on which to stamp seals, but the purpose to which they are now chiefly put is that of fastening papers together. In the Catholic Church the thin round disc of unleavened bread used in the celebration of the eucharist is called a wafer, from the fact that the bread of the Jews was of this shape. They are stamped with a cross or other sacred symbol.

Wagering. All contracts or agreements, whether verbal or in writing, by way of gaming or wagering, are null and void, and no action is maintainable for recovering any money or other valuable article alleged to be won upon any wager, or which has been deposited in the hands of any person to abide the event of the wager.

Waghorn. [OVERLAND ROUTE.]

Wagner, WILHELM RICHARD, composer, was born at Leipzig, Saxony, on May 22nd, 1813, and early showed signs of his genius for music, spending six months under Theodor Weinlig, his best master, after he had matriculated at Leipzig University (1830). In 1833 he wrote his first opera *Die Feen*, and this was followed by *Henzi* (1842), *Der Fliegende Holländer* (1843), and *Tannhäuser* (1845). Up to this time he had been content to

follow, more or less, the conventions of the old Italian opera, but in *Lohengrin* (1850), his next work, he began to develop his theories of the new opera. In 1854 *Das Rheingold* was completed (first performed in 1869), and this was followed by *Die Walküre* in 1856 (produced 1870), *Tristan und Isolde* (completed 1859, produced 1865), *Siegfried* (finished 1869, produced 1876), *Die Götterdämmerung* (completed 1874 and produced 1876), the last two and the first two constituting the cycle of the Nibelungen Ring tetralogy. He had meanwhile composed his comic opera *Die Meistersinger*



RICHARD WAGNER.

von Nürnberg (1868). In 1882 his greatest work, *Parsifal*, was produced at Bayreuth, at the theatre built for him by Ludwig II. of Bavaria. In 1870 Wagner married, for his second wife, Cosima, daughter of Liszt, and previously wife of Von Bülow. He died at Venice on February 13th, 1883, and five days later his remains were buried in the vault in his garden at Bayreuth. Much of his life was spent in storm and stress. Owing to political ferment, in which he was said to be involved, he was obliged to go into exile in 1849, and the ban was not removed till 1862. Of his numerous literary works, which mostly had a distinct bearing on his art, the more important were *Die Kunst und die Revolution*, *Das Kunstwerk der Zukunft*, *Oper und Drama*, *Eine Mittheilung an meine Freunde*, *Das Judenthum in der Musik*, *Ueber das Dirigiren* and *Beethoven*. Wagner's aim was no less than the reform of Opera from the standpoint of Beethoven. For this he suffered

innumerable hardships and insults, but genius and "form" (in the sporting sense) told in the long run. Having seen of the travail of his soul he was satisfied even ere he died, and now reigns the universal King of Opera.

Wagtail, a bird belonging to the Passerine genus *Motacilla*, with about thirty species, ranging over the greater part of Europe, Asia and Africa, and also Alaska. Wagtails are active, graceful birds, generally found in open pastures, and by the banks of ponds and streams, feeding on insects and small molluscs. They are continually in motion, and derive their scientific and popular names from their habit of jerking the tail up and down. Five species are British. The Pied Wagtail (*M. lugubris*) is about seven inches long, with black-and-white plumage. It is one of the best-known British birds, and no one who has ever seen it standing on a stone in a stream and flirting its tail can ever mistake it. Other British species are the Yellow Wagtail (*M. rayi*), the Blue-headed Wagtail (*M. flava*), the White Wagtail (*M. alba*), and the Grey Wagtail (*M. boarula*). Some of these were formerly placed in different genera, principally on account of their coloration.

Wahabee, one of the followers of Abd-el-Wahhab (1691-1787), a Mohammedan reformer, who opposed all practices not sanctioned by the Koran. His successors established themselves strongly in Nejd in Central Arabia, and though suppressed in 1818 by Ibrahim Pasha they afterwards regained much of their supremacy.

Waits, a body of musicians and singers who patrol the streets at Christmas time singing carols. The first waits appear to have existed about the end of the 14th or the beginning of the 15th centuries, but they were in no sense carol-singers, fulfilling many functions of which that of watchmen was the chief. One of the first references to them is contained in a detailed account of the Palace expenses of Edward IV. In the *Liber Niger Domus Regis* "a wayte" is mentioned who should "nyghtely from Mychelmas to Shreve Thorsday pipe the watch within this court fowere tymes: in the Somere nightes three tymes and maketh bon gayte at every chambre doare and offyce, as well for feare of pyckeres and pilfers." But this "wayte" seems to have had other duties to attend to, for amongst the instructions given him was one that he should see that all gates, doors and offices were bolted so as to protect the Palace against robbery and thieves and against fire. One of his special duties was to be in attendance at the installation of the Knights of the Bath and watch their clothing in the chapel during the night services, for which he received all the clothing that the knights had worn before changing into their knightly garb. He was known in the Court as the yeoman wait and under him was a groom wait who assisted him in his office. They both wore livery similar to that of the Court minstrels and dined and lived with them in the minstrels' hall, being allowed half a loaf and a gallon of ale during the summer time and a loaf and a gallon of ale during the

winter, besides coal and candles, and the yeoman was to be paid the sum of fourpence-halfpenny per day, if the treasurer and steward of the household considered him worth it—if not, only threepence; the groom wait getting half as much. Dr. Rimbault states that among the entries in the rolls of the officers and men in the time of Henry VII. was one "Musicians for the Wayghtes." The wayghtes in this case meant simply the instrument which at a later date was called the hautboy, hoboy, or oboe, and may or may not have had anything to do with the waits of that time. In many towns a regular company of waits was established to watch the town during the night and perform on instruments on all ceremonial occasions. Exeter appears to have had the first regular company of waits, who were established in 1400, probably the first in Great Britain. During the reign of Henry VIII. there are two entries in the records of the Privy Purse for the payment of the city waits of Canterbury. The waits of the City of London date from the beginning of the 15th century, and were recognised as part of the City's officers. Not only did they play upon the hautboy and horns at civic festivals and in processions, but during the night they had to fulfil the duty of watchmen to see that no crime, robbery, or fire took place, and at certain hours had to sound their horns and shout that all was well with the City. The dedication of Morley's *Consort Lessons* (1599) to the Lord Mayor and Aldermen of the City of London seems to indicate that these waits were no mean musicians. It runs:—"As the ancient custom of this most honourable and renowned city hath ever been to retain and maintain excellent and expert musicians to adorn Your Honour's favour, feasts and solemn meetings—to these Your Lordships' waytes I recommend the same—to your servants' careful and skilful handling." In 1582, according to extracts from the *Remembrancer* for 1878, the Earl of Leicester wrote to the Lord Mayor requesting that his servant might be given a vacancy which had occurred in the City waits. At Alnwick in 1756 women formed part of the town waits. In the *Gentleman's Magazine* of that date, speaking of a civic ceremony a writer says they were "dressed up with ribbons, bells, garlands of gum flowers," and welcomed by the civic authorities with "dancing and singing and are called timber waits, perhaps a corruption of timbral waits, 'players on the timbral.'" But these may not have been the town waits of Alnwick, but a group of women collected for the occasion. The waits belonging to the cities, towns and boroughs were distinguished by what was called a wait's badge, which was usually an escutcheon with the arms of the borough to which they belonged, and mostly these can be seen in the treasuries of towns and boroughs. The City of London waits wore blue gowns, with red sleeves, caps, and silver chains round the necks to which were suspended silver badges of the City arms. At the beginning of the 17th century the custom of waits as musicians and not as watchmen was introduced. These were bands of musicians who travelled about from place to place playing popular airs. Often they were musicians of very good

repute who had nothing better to do. Usually they called upon the houses before which they had played once a week to secure some small gratuity on which they lived. In those times it was quite the fashion for young cavaliers to pay one of these waits or wait-bands to play under the window of the girls to whom they were paying their attentions. The richer of these young dandies would often spend large sums of money so as to procure a good musician who would play sweet love songs at the lady's window. A fashionable paper of the time says, "There is scarce a young man of any fashion who does not make love with the town music. The waits often help him through his courtship; and my friend Banister has told me he was proffered five hundred pounds by a young fellow to play but one winter under the window of a lady." This seems an exorbitant sum for the hire of a wait at that period, but nevertheless it is most likely a good criterion of what the most fashionable of these town musicians received for their duties. At this time the waits belonging to the Corporation of London seem to have become less musical and all they did was to blow their trumpets during the night when they were on watch. Towards the end of the 18th century the City waits had grown a large band, and were looked upon as the City Police. They were inadequately paid and crimes were committed with impunity. In the early part of the 19th century much was done to get rid of these "Charlies," as they came to be called, whose incapacity and decrepitude were proverbial. By this time the musical waits had parted company with the civic band, and at the beginning of the Victorian Era waits were unheard of except at Yuletide. But until 1820 these musical waits had a certain degree of official recognition. The waits of London City and Westminster had over them an official appointed by the Chief Constable, and about this date on inquiry it was found that many besides the real waits were serenading the City for gratuities. Attempts were made to stop these impostors, but it was useless. The really good musicians who had once frequented the streets at festive and other seasons disappeared and gave place to a band of men playing ill-tuned instruments and singing with husky voices popular songs and Christmas carols. Usually the waits chose their districts about a month before Christmas and about the beginning of December would appear in the streets, going from house to house. This would continue for about two or three nights a week until Christmas was over and the New Year had begun, when it was customary to go round from door to door and ask gratuities from the householders. The custom is now on the wane, and except in rural districts and the most fashionable and moneyed parts of cities and towns waits are seldom heard.

Wakefield, a town in the West Riding of Yorkshire, England, on the left bank of the Calder, 8 miles S. by E. of Leeds. It was the scene on December 30th, 1460, of the defeat and death of Richard, Duke of York, in one of the battles of the War of the Roses, and played a part, too, in the Civil War. When it was constituted a bishopric in 1888,

the fine Perpendicular parish church became the cathedral. Other buildings include the Grammar School, Town Hall, Corn Exchange and Fine Art Institute. The manufactures comprise woollen yarns, cloth, hosiery, agricultural implements and machinery, besides dye-works. Pop. (1901), 41,544.

Walcheren, the most westerly island of Holland, in the province of Zeeland, between the East and West Scheldt. It is 13 miles long by 10 miles broad, is protected from the sea by dikes, is fertile and pastures large numbers of cattle. The port of Flushing (18,893) lies on its southern side and Middelburg (18,831) is the capital. Walcheren was the scene of the disastrous expedition of the British forces in 1809.

Waldeck-Pyrmont, a principality of North Germany, consisting of two detached portions with a united area of 433 square miles, governed by a hereditary prince, but wholly subordinate to Prussia. Waldeck is enclosed by Westphalia and Hesse-Nassau. Pyrmont lies 30 miles to the north, and its 25 square miles are surrounded by Hanover, Brunswick and Lippe-Deilmold. Both divisions are in the basin of the Weser and consist mainly of hills and forests, with fertile valleys and pastures. Cattle, timber, fine wool, iron and honey are exported, but the mineral waters of Pyrmont supply the bulk of the revenue. Arolsen (2,811) in Waldeck is the residence town. Pop. (1900), Waldeck, 49,282; Pyrmont, 8,636—total 57,918.

Waldenses, a Christian community named from Peter Waldo, a rich citizen of Lyons, who, about 1170, divided his wealth among the poor, and became the leader of a body of wandering preachers. The Waldenses were expelled from Aragon in 1194, and went to Strasburg, where a party of them were burned in 1212. Many of them perished in the crusade against the Albigenses, though they were not open to the charge of heresy, and in 1218 they were condemned by the fourth Lateran Council. In 1532, however, a synod was held in the Valley of Angrogna, in which it was resolved to accept the doctrines of the Calvinists and to conform to their religious usages. From this time they became merged in the general body of Protestants, but they were still liable to outbursts of persecution such as that which called forth John Milton's noble sonnet in 1655.

Wales, one of the three primary divisions of the island of Great Britain, is bounded on its eastern side by the English counties of Cheshire, Shropshire, Hereford and Monmouth, and on the other three sides is washed by the sea. Its greatest length, from north to south, is 135 miles; its breadth, from east to west, varies from 37 miles near the parallel of Aberystwith, where it is narrowest, to 95 miles near the parallel of St. Davids, where it is widest. It has an area of 7,446 square miles, and a population of 1,720,609. Though administered in the main as a part of England, it is recognised by Parliament as an organic and homogeneous unit, and as such has received distinctive treatment in the Intermediate Education and other exclusively Welsh Acts. The

names Wales and Welsh are from a Teutonic root, meaning "foreign" (compare German *Wälsch* = "Italian"), but the Welsh themselves call their country Cymru and its people Cymry—names which, however, according to Professor Rhys, did not originate earlier than the 6th century. The country is divided into twelve counties, the largest being Caermarthenshire, and the most populous Glamorgan, and its present dimensions date from 1535, when Henry VIII. severed Monmouthshire from Wales and joined it to England. Its general aspect is bold, romantic and mountainous. It is intersected by beautiful valleys and traversed by numerous streams, and although it has no rivers of any magnitude (the most important being the Clwyd, Conway, Dee, Dovey, Teify, Towy and Usk), it gives rise to the Severn and the Wye. The principal mountains of North Wales are the Snowdon group, with Y Wyddfa (3,571 feet) as its culminating pinnacle, the Cader Idris chain (2,925 feet), and the Berwyn range (2,716 feet), while in South Wales are the Beacons of Brecon (2,910 feet) and Caermarthen (2,600 feet), and the Black Mountains. Though largely an agricultural country, Wales contains some of the most important coal fields and iron industries of Great Britain, and in a lesser degree produces lead, zinc and copper; gold is found in Merionethshire, and silver mines used to be worked in Cardiganshire, where, in the 17th century, a coinage was issued stamped on one side with the ostrich plumes of the Prince of Wales. The largest slate quarries in the world lie in the Cambrian rocks of Caernarvonshire. The Church of England is legally established (the bishoprics being Llandaff, St. Davids, Bangor and St. Asaph), but is greatly outnumbered by the various Nonconformist bodies. Wales sends thirty representatives to the Imperial Parliament.

Language and Literature. Though English is very generally understood throughout Wales, and has even largely displaced the native tongue in Radnorshire, part of Pembrokeshire, Gower, Cardiff and other towns in South Wales, Welsh is still spoken by more than half the people in Wales and Monmouthshire. It is full of life and vigour, and though not to any great extent the language of commerce, is still the language of social life, of religion and of literature. In 1865 a Welsh colony was established on the Chupat River in Patagonia. Modern Welsh literature is both large in quantity and progressive in excellence, and many newspapers and periodicals are issued in the Welsh language. Classic Welsh literature has a continuous history extending from the 6th century to the present day, divided by Thomas Stephens (1821–1875), in his *Literature of the Kymry* (published in 1849), into four periods. Of the productions of the first of these little exists besides the *Gododin* of Aneurin. In the second, between 1080 and 1350, appeared a number of lyric poets, remains of whose works we still possess, and whose themes were principally patriotism and war. Among them were Gwalchmai, Hywel ab Owain, Cynddelw and Rhys Goch ab Rhiccart. It was in this period that the Arthurian and other romances known as the *Mabinogion* were written down, having probably

been in circulation as tales for centuries before. The Welsh traditions of Arthur and his knights have had a marked influence on the literature of Europe. In the third period (1350 to 1650) flourished David ab Gwilym, the most celebrated of all Welsh poets, Lewis Glyn Cothi, Tudur Aled and Rhys Pritchard; and to this era most of the Welsh Triads are attributed. The fourth period begins with the poet Huw Morus, and includes Goronwy Owen, Elis Wyn, Eben Fardd, Carnhuanawc, Dr. Lewis Edwards, Daniel Owen and many others. Classic Welsh poetry is weighed down by the iron chains of alliteration, and the rules of "cyng-hanedd." Welsh prose is largely theological and biographical; the drama is absent except in the interludes of Twm o'r Nant, and the novel only came into existence in the works of Daniel Owen.

History. The real history of the Welsh people, as distinguished from the fortunes of kings and princes, remains yet to be extracted from the poetry, the traditions and the ancient laws of Wales, in which it lies buried. The history of Wales as an independent political community is one long tragedy of internal strife, attacks from without, and final conquest by Edward I. After the Romans left Britain, about the year 410, the two Britanniæ were governed by native successors of the Dux Britanniarum called Gwledigs, who probably continued for a long time to hold some sort of lordship over the British states, comprising Wales proper, Cornwall, Cumbria and Strathclyde. By the battle of Deorham in 577 Cornwall was isolated, and by the battle of Chester in 613 Wales proper was separated from the other British states. The two Gwledigs of whom we know anything were Cunedda Wledig early in the 5th century, and Maelgwn Gwynedd in the 6th, and their descendants appear not only to have reigned as princes over the various lesser states of Wales, but also to have retained amongst them the power of the Gwledig for several centuries. In the 9th century we find Rhodri Fawr reigning as king of all Wales, and after the death of his grandson, Hywel Dda, there followed a long period of internecine strife, and wars with the Danes and the English. In 1055 Gruffydd ab Ilewelyn became king of all Wales, and the next half-century is filled with the attempts of the Norman barons to establish themselves in various districts, and the efforts of the Welsh princes to expel them. Invasions of Wales were made by Harold, William the Conqueror, Rufus, Henry I., Henry II., John and Edward I. The last century of Welsh independence is nearly covered by the long reigns of Llewelyn ap Iorwerth (1194-1246), and Llewelyn ap Gruffydd (1246-83). With the death of the latter in a skirmish on the banks of the Wye, Welsh independence came to an end.

WELSH, the inhabitants of Wales. In this nationality are merged several ethnical elements, of which the oldest appear to have been the Silurians, of unknown origin, but almost certainly non-Aryans and possibly Iberians from Spain or Aquitania. These were followed and, no doubt, largely absorbed, still in prehistoric times, by two distinct waves of Celtic migration, first the

Gadhaelians, whose presence is shown by numerous geographical names, and later by the Kymry, who still form the great majority of the population. They were joined in the 5th century of the new era by many Romanised Britons, flying from the Saxon



SKETCH-MAP OF WALES.

invaders; but these refugees, mostly of kindred stock, appear to have been rapidly assimilated to the dominant Kymry, who had preserved the national speech during the Roman period. Then came in the 12th century numerous Flemish artisans, settled in South Wales (Pembrokeshire), and since that time a slight but continuous infiltration of English and Irish, by whom the Welsh domain has been largely encroached upon, especially along the marches (borderlands) between Flintshire and Monmouth, in all the seaports, watering-places, mining and other industrial centres; but the Welsh national sentiment, which has at all times displayed immense vitality, is still dominant in most of the Principality, asserting itself in the church, in the schools, in the periodical literature, and in the *cisteddfodau*, annual musical and literary gathering, which recall the *gorsedd*, or open-air assemblies of pagan times. Physically the Welsh belong to the dark division of the Caucasian race, as shown especially by the prevailing dark-brown and even black hair, the dark eyes, small nose, often rather concave than straight, the light active frames, and somewhat short stature. In all these respects they approach the so-called Celtic type, as studied by Pierre Paul Broca (1824-80) in Brittany, Auvergne and Savoy, and in some of their mental

qualities they also resemble the inhabitants of these regions, where the Gaulish (Kymric) race is supposed to be best preserved. They are impulsive, emotional, more religious than moral, fond of oratorical display, music and poetry, without perhaps reaching the highest excellence in any of these arts. Nevertheless, European literature is indebted to them for the Arthurian legend, and preserves the memory of Taliesin and other renowned singers.

Wales, Prince of, the heir apparent to the Throne of the United Kingdom. The title is conferred afresh on each holder. The first holder of the title was Edward of Caernarvon, son of Edward I., who was born in Caernarvon Castle on April 25th, 1284. He was created Prince of Wales in 1301 and ascended the throne as Edward II. The two badges of the Prince are a plume of three ostrich feathers with the motto, "Ich Dien" ("I serve") and a dragon (the badge of Wales).

Walker, FREDERICK, painter, was born in London on May 26th, 1840, and studied for a time at the Royal Academy Schools. He afterwards apprenticed himself to J. W. Whympier, the wood engraver, an experience which was of great value to him afterwards as a black-and-white draughtsman. In 1863 he first exhibited at the Royal Academy, of which he was elected an associate in 1871. He died at St. Fillans, Perthshire, on June 4th, 1875. Among his best pictures were "The Wayfarers" (1866), "The Bathers" (1867), "The Vagrants" (1868), "The Old Gate" (1869), "The Plough" (1870), "At the Bar" (1871), "The Harbour of Refuge" (1872) and "The Light of Way" (1875). His work was distinguished by its accurate and graceful drawing, its fine colour and the charm and sincerity of its feeling.

Wallace, ALFRED RUSSEL, naturalist, was born at Usk, Monmouthshire, on January 8th, 1823, and educated at Hertford Grammar School. After acting as a land surveyor and architect with his brother, he went in 1848 with H. W. Bates to the Amazon, where he spent four years, and afterwards by himself to the Malay Archipelago, where he lived from 1854 to 1862. Independently of Charles Darwin, he thought out a theory of natural selection and is entitled to share with the former the honour of its discovery. Among his chief works were *Travels on the Amazon* (1853), *The Malay Archipelago* (1869), *Natural Selection* (1870), *The Geographical Distribution of Animals* (1876), *Darwinism* (1889) and *My Life* (1905). Wallace has always taken an unconventional view of things and is an advocate of the nationalisation of the land, an opponent of vaccination and a believer in spiritualism.

Wallace, SIR RICHARD, connoisseur, was born in London on July 26th, 1818. He was the natural son of Maria Fagnani, Marchioness of Hertford, who took sole superintendence of his education. His youth and early manhood were spent in Paris, where he began to collect all manner of objects of art and acquired an unrivalled knowledge of their worth and qualities. On the death of his half-

brother, the 4th Marquis of Hertford, in 1870, he fell heir, *inter alia*, to Hertford House in London and the unique collection of pictures and articles of vertu. He was created a baronet in 1871 for his services to British residents and to the cause of humanity during the siege of Paris. He died in Paris on July 20th, 1890. On the death of his widow in 1897, she left by will the Hertford-Wallace collection to the English nation, the most sumptuous bequest it has ever received from a single person. Hertford House was shortly afterwards acquired and adapted to the purposes of a public museum and art gallery.

Wallace, SIR WILLIAM, the national hero of Scotland, was the younger son of Sir Malcolm Wallace of Elderslie in Renfrewshire, where he was born about 1274. According to Professor A.F. Murison, the best and most cautious biographer of the patriot, the Wallaces were related to the Stewards of Scotland. He was early embittered against the English oppressors of his country and for a few years harried them at different places with more or less success. After the attack on Lanark (1297), in which he slew Hæzclrig the Sheriff for putting his wife to death, Wallace was joined by a party among the Scottish nobles, but they soon afterwards acknowledged Edward as sovereign by the Treaty of Irvine. Supported by Sir Andrew Moray, however, Wallace attacked the English forces under the Earl of Surrey at Stirling Bridge on September 11th, 1297, and gained a complete victory, which he followed up by a raid into England. On his return he was appointed Guardian of the Kingdom, but his attempts at reorganisation were thwarted by the jealousy of the barons. Meanwhile Edward had returned from Flanders and hurried to Scotland, where he defeated Wallace at Falkirk (July 22nd, 1298). Wallace's movements after the battle are obscure, but he seems to have visited France to solicit the help of the King. Edward I. in his hatred of him stuck at no scruple and Sir John de Menteith betrayed the hero to the English at Robroyston near Glasgow in 1305. He was at once conveyed to London, where he was hanged at Smithfield on August 23rd. His head was exposed on London Bridge and his quarters were hung up in gibbets—one at Newcastle, another at Berwick, a third at Stirling and the fourth at St. Johnston (Perth).

Wallachians. [ROUMANIANS.]

Wallenstein (properly, WALDSTEIN), ALBRECHT EUSEBIUS WENZEL VON, general, was born at Hermanic in Bohemia on September 24th, 1583. After studying at the Universities of Altdorf, Bologna and Padua, and distinguishing himself in battle against the Turks, he married (1606) a widow whose wealth and estates raised him to a high position amongst his countrymen. He was appointed quartermaster-general under Tilly in Bohemia (1620), and in 1621 and 1623 rendered important services against Bethlen Gabor in Moravia. In 1625 he was made duke of the new principality of Friedland. Early in the following year he raised an army of 30,000 men, which he placed entirely at

the Emperor Ferdinand's disposal, and, co-operating with Tilly, conducted a brilliant campaign against Count Mansfeld. The two generals were equally successful against Christian IV. in 1627, and the Duchy of Mecklenburg, which Wallenstein had seized, was handed over to him as a reward for his services. He was baffled in his attempt to make Ferdinand supreme in the Baltic by his failure before Stralsund (1628), but the hostility of Denmark was brought to an end by the Peace of Lübeck (1629). The jealousy of the nobles, who regarded him as an arrogant upstart, led to his temporary disgrace in 1630, but the early successes of Gustavus Adolphus and the death of Tilly rendered his recall imperative, and in the spring of 1632 he was placed at the head of an army which owed obedience to him alone. After expelling the Saxons from Bohemia, he marched against the Swedes and repelled the attack on his entrenched camp near Nuremberg, but was defeated on November 16th, 1632, at Lützen, the battle in which Gustavus Adolphus lost his life. After resuming hostile operations in Lusatia he withdrew at the close of 1633 into Bohemia, and took up his quarters at Pilsen. In January, 1634, a secret patent was issued depriving him of his command, and a few weeks later another patent was published at Prague, in which he was openly charged with treason. He hurried to Eger in Western Bohemia, hoping to find a protector in Bernhard of Saxe-Weimar, but immediately on his arrival he was murdered, on February 25th, 1634, by Colonel Butler and Captain Devereux, who had been given to understand that tidings of his death would be welcome at Court.

Waller, EDMUND, poet, was born on March 3rd, 1606, at Coleshill, then in Hertfordshire (now in Buckinghamshire), and educated at Eton and King's College, Cambridge. After the death of his first wife he courted Lady Dorothy Sidney, the "Saccharissa" of his verses, but his suit was unsuccessful. In 1644 he was banished for complicity in a plot against the Parliamentary cause, but was pardoned in 1651 and after the Restoration enjoyed high favour at Court, and was a very popular member of the House of Commons. He died at Beaconsfield on October 21st, 1687. As a poet his influence was exerted chiefly in reshaping the heroic couplet, which now became the favourite English metre. His place in literature is secured by his "Go, lovely rose," the lines "On a Girdle," and "Of the last verses in the book."

Wallflower (*Cheiranthus Cheiri*), a Cruciferous plant native to Southern Europe, and growing commonly as an escape from cultivation on ruins, old walls and sea-cliffs in the United Kingdom. It is a herbaceous perennial, pubescent, with adpressed bifid hairs; has entire lanceolate-acute leaves, corymbosely racemose flowers with long claws and large spreading limbs to the petals and pouches to the two lateral erect sepals. The silique is four-angled, the stigma is sub-sessile, the seeds are uniseriate and compressed, and the cotyledons accumbent.

Wallons. [BELGIUM.]

Walmer, a watering-place, Kent, England, immediately to the south-west of Deal, of which it may be considered a suburb. It has an extremely pretty front and is a popular health resort. Walmer Castle, dating from the reign of Henry VIII., is the official residence of the Warden of the Cinque Ports, and it was here in that capacity that the Duke of Wellington died in 1852. There are barracks and a military hospital. Pop. of parish (1901), 5,614.

Walnut, a name of German origin, meaning foreign nut, applied to *Juglans regia*, probably a native of the mountains of Asia, from the Caucasus to Kashmir and Sikkim, to Persia, Lebanon and Asia Minor. In Sikkim the tree grows at altitudes of from 4,000 to 7,000 feet. Walnut wood is light, a cubic foot weighing only about 47 pounds, it is tough and strong, and takes a good polish. It is the best wood for gun-stocks, and being, especially in old trees, beautifully veined, is in request for cabinet-work. The tree has deciduous, glabrous, yellowish-green, pinnate leaves; precocious flowers, of which the males are in catkins and the female are borne three together at the end of a branch; and a fruit of an exceptional type. The receptacular tube is adherent, so that the ovary is inferior: there are generally two fleshy stigmas, and the receptacular tube forms a fleshy bitter green "epicarp," which surrounds the "nut" or "endocarp." This so-called epicarp yields a dark-brown dye. When ripe it splits irregularly, so that the fruit is termed "dehiscently drupaceous." The nut has a two-valved woody shell, containing one exalbuminous seed with corrugated cotyledons and a thin, brown, bitter testa. It is picked whole when green. It ripens by the end of September, and is esteemed as a dessert nut.

Walpole, HORACE, 4TH EARL OF ORFORD, author, third son of Sir Robert Walpole, was born in London on September 24th, 1717, and educated at Eton and King's College, Cambridge. He started on the grand tour in company with Thomas Gray (1739), but quarrelled with the poet and returned to England separately (1741). He had been elected in his absence member for Callington in Cornwall in 1741, and continued to sit in Parliament till 1768, but very seldom took part in the debates. In 1747-8 he acquired the house near Twickenham to which he gave the name of Strawberry Hill and to the development of which he devoted the best part of his life. In 1791 he succeeded his nephew in the earldom and died in London on March 2nd, 1797. Walpole's tastes were those of a literary epicure. His *Anecdotes of Painting in England* (1762-71) and *Catalogue of Engravers* (1763) are of undoubted value. The pseudo-romantic sentiment which inspired the *Castle of Otranto* (1764) was destined to bear abundant fruit in the novels of Ann Radcliffe and Monk Lewis. The *Memoirs of the Last Ten Years of the Reign of George II.* and those of the *Reign of George III.* contain matter which the historian cannot afford to neglect. But it is by his *Letters*, ranging over the period from 1735 to 1797, that Walpole will always occupy a well-earned place in English literature.

Walpole, SIR ROBERT, EARL OF ORFORD, statesman, was born at Houghton, his father's seat in Norfolk, on August 26th, 1676, and educated at Eton and King's College, Cambridge. He entered Parliament in 1701, and speedily attracted the notice of Godolphin, Marlborough and other Whig leaders. He was appointed Secretary at War in 1708, and two years later was one of the managers of Sacheverell's trial, of which he secretly disapproved. After the return of the Tories to power he was expelled the House and imprisoned in the Tower for five months (1712) on a charge of corruption whilst in office, but he succeeded in making good his defence, and on his release was re-elected for King's Lynn. When George I. succeeded Anne, Walpole was selected to preside over an inquiry into the conduct of the last Ministry, and in 1715 became First Lord of the Treasury and Chancellor of the Exchequer; but, owing to the king's dislike and disputes with his colleagues, he resigned in 1717, after establishing the first Sinking Fund. Finding opposition hopeless, he rejoined the Ministry as Paymaster of the Forces in 1720, and justified the confidence of the public by his financial policy after the bursting of the South Sea Bubble. Left without a rival on the death of Stanhope, he became Chancellor of the Exchequer and Prime Minister in 1721, and continued in power for twenty-one years, in spite of the combined opposition of the Whig supporters of Pulteney and the Tories under Bolingbroke. During this period, however, he was preparing the way for his own fall by driving his ablest colleagues, such as Carteret and Chesterfield, into the ranks of his opponents. His pacific policy was hateful both to the king and the Opposition, and in 1739 he was driven, sorely against his will, into a war with Spain. The expeditions to Spain were unsuccessful, and in 1742 Walpole resigned, receiving at the same time an earldom and a pension. His closing years were spent in retirement, and he died in London on March 18th, 1745.

Walpole, SIR SPENCER, historian, was born in London on February 6th, 1839, and educated at Eton. He was the grandson of Spencer Perceval and his father was thrice Home Secretary. After spending several years in the Civil Service and as a Parliamentary secretary, he was appointed Lieutenant-Governor of the Isle of Man in 1882 and in 1893 became Secretary to the Post Office. On his retirement in 1899 he was made K.C.B. He died at Coleman's Hatch, Sussex, on July 7th, 1907. His chief works were the *Life of the Right Hon. Spencer Perceval* (1873), *A History of England from the conclusion of the Great War in 1815* (1878-86), and the *Life of Lord John Russell* (1889).

Walrus, a marine mammal of the genus *Trichechus*, type of a family (Trichechidae) of Fissiped Carnivora, intermediate between the True Seals and the Eared Seals. Some authorities recognise two species—*T. rosomarus*, from Arctic seas, and *T. obesus*, from the North Pacific, but the latter is doubtfully distinct. An adult male measures about ten feet in length, and is very bulky, especially about the fore-quarters. There is no external ear, and on

land the hind limbs are turned forwards, as in the Eared Seals. The upper canines are developed into tusks, sometimes two feet long, which are used in digging up from the bottom the molluscs on which these creatures principally feed.

Walsall, a town of Staffordshire, England, 8 miles N.W. of Birmingham. The principal buildings are St. Matthew's Church in the Transition style, the Grammar School (founded in 1554), Public Library, Science and Art Institute, Guildhall and the New Town Hall (1902). There are several public parks including a fine Arboretum. The manufactures comprise every variety of saddlers' ironmongery, harness, locks, bolts, chains and other hardware, besides iron- and brass-founding, tanning and flour-milling. In the vicinity are extensive coal mines, while ironstone, limestone and brick clay also are obtained in large quantities. Walsall was the scene of the charitable efforts of "Sister Dora" Pattison (1832-78), to whom a statue was erected in 1886. Pop. (1901), 86,430.

Waltham Holy Cross, a town of Essex, England, on the Lea, 12 miles N. of London. It is renowned for its magnificent Norman church, really the nave of the famous abbey church, consecrated in 1060 and allowed to fall into neglect after the dissolution of monasteries by Henry VIII. Harold, its founder, who fell at Hastings, was buried beside the high altar. One mile to the west stands (restored in 1833) one of the beautiful crosses erected by Edward I. at one of the resting-places of the body of his Queen Eleanor on its way to burial in Westminster Abbey. Waltham has manufactures of gunpowder, cordite and small arms. Pop. (1901), 6,549.

Walthamstow, a town of Essex, England, 6 miles N.E. of London, of which it is virtually a suburb. It has become, to a very large extent, a residential quarter of artisans. Besides St. Mary's Church, it has a Town Hall, Literary Institute, Science and Art School and several charitable and educational institutions. Its proximity to Epping Forest has rendered it extremely popular. Pop. (1901), 95,131.

Walton, IZAAK, author of *The Complete Angler*, was born at Stafford, England, on August 9th, 1593. He appears to have come to London as a young man and set up as an ironmonger in Chancery Lane. His happy disposition and beautiful character—"honest Izaak" is almost his stereotyped description—attracted troops of friends and, after an uneventful life, he died at Winchester on December 15th, 1683. The first edition of *The Complete Angler* was published in 1653; it was extended by the author during his lifetime, and enlarged by the addition of Charles Cotton's continuation in 1676. An immaculate copy of the first edition belonging to W. C. van Antwerp of New York, which was originally published at 1s. 6d., fetched at Sotheby's Rooms in London on March 23rd, 1907, the record price of £1,290. Walton also wrote *Lives of John Donne* (1640), Sir Henry Wotton (1651), Richard Hooker (1652), George Herbert (1670), and Robert Sanderson (1678).

Waltz (German, *walzer*, from *walzen*, "to roll"), a round dance, probably of Bohemian origin, which became popular in several European countries towards the close of the 18th century, and was introduced into England in 1813.

Wandering Jew. The legend of the Wandering Jew tells of a man who insulted the Saviour on His way to Calvary, urging Him forward with curses when He sank beneath the weight of the Cross. Jesus made answer, "I go, and that quickly, but thou shalt wait till I return"; and in fulfilment of this judgment the Jew wanders over the earth, awaiting the Last Day. The legend has figured largely in Literature.

Wanderoo, properly the name of two Slender Monkeys from Ceylon, but applied usually to the Lion-tailed Monkey (*Macacus silenus*) from the Western Ghats of India. The length is about three feet, of which the tail (tufted with white) forms about one-third; the fur is black, and round the face is a long thick fringe of whitish hair.

Wapentakes, the name given in Yorkshire to those territorial divisions of a county which are called elsewhere hundreds.

Wapiti (*Cervus canadensis*), the Cree Indian name for the large North American elk which corresponds to the European red deer or stag. It stands about fifty-four inches at the shoulder, frequents low and marshy grounds, and is much hunted for its skin, which makes excellent leather, but the venison is indifferent.

Warbler, a popular name for birds of the Passerine family Sylviidae, from the powers of song possessed by many of them. It is generally confined to birds of the sub-family Sylviinae of the Thrush family. These birds are generally of small size and sober plumage, for the most part alike in both sexes. British species or visitors are: The Whitethroat, the Lesser Whitethroat, the Orphean Warbler (*Sylvia orphen*), the Blackcap, the Garden Warbler (*S. hortensis*), the rare Barred Warbler (*S. nisoria*), the Dartford Warbler (*S. undata*), the Golden-crested Wren, the Fire-crested Wren (*Regulus ignicapillus*), the Yellow-browed Warbler (*Phylloscopus superciliosus*), the Chiffchaff, the Willow Wren (*P. trochilus*), the Wood Wren (*P. sibilatrix*), the Rufous Warbler (*Aidon galactoides*), the Icterine Warbler (*Hypolais icterina*), the Reed Warbler (*Acrocephalus streperus*), the Marsh Warbler (*A. palustris*), the Great Reed Warbler (*A. turdoides*), the Sedge Warbler (*A. phragmitis*), the Aquatic Warbler (*A. aquaticus*), the Grasshopper Warbler (*Locustella naevia*), and Savi's Warbler (*A. luscinoides*).

Warrant, and **Warrant of Attorney**, a precept under hand and seal to an officer to execute or carry out process of any kind according to due course of law. Warrants are used both in civil and criminal cases. In the former category may be named warrants from the sheriff of a county to his officers to execute process, warrants of distress and sale; in the latter warrants authorising the arrest or apprehension of persons charged with or

suspected of having committed indictable offences, warrants to discharge from prison a person who has been bailed, warrants of commitment, etc. A warrant of attorney is a written authority addressed to a solicitor of the court in which it is intended that a judgment shall be entered up, authorising him to appear and receive a statement for him in an action brought or to be brought against him at the suit of a person named and to confess the same or suffer judgment to pass by default. It also authorises him to execute a release of errors touching the judgment.

Warranty. A warranty is an engagement or undertaking forming part of a sale or other transaction. It differs from a mere representation, as it constitutes in effect an absolute engagement on the part of the warrantor, whether made in good faith or not, and, unless it be strictly and literally performed, the contract is avoided, or he becomes liable to an action for breach of warranty, according to the nature of the transaction. Warranties are also implied in the following cases:—(1) A warranty of title will be presumed when the goods sold are at the time of the sale in the possession of the vendor or of a third person, unless the contrary be then expressed; (2) when an examination of the goods is from their nature or situation impracticable; (3) where goods are to be manufactured or to be procured for a particular purpose, a warranty of their reasonable fitness will be presumed; (4) a warranty will be presumed against all latent defects in two cases—(i) when the seller knew that the buyer did not rely on his own judgment, and (ii) when from the situation of the parties the seller might have provided against defects, or where a warranty may be presumed from the very nature of the transaction; (5) where goods are sold by sample a warranty is implied that the bulk corresponds to the sample in nature and equality.

Warrington, a town of Lancashire, England, on the right bank of the Mersey, midway between Liverpool and Manchester. It is mentioned in Domesday, but contains few relics of antiquity, the Saxon church of St. Elphin having given place to a later structure. The bridge (1496), connecting Lancashire with Cheshire, has witnessed several stubborn fights. Fustians, corduroys, sacking, sail-cloth, glass, pins and tools are the chief articles of manufacture, and the ale has high repute. Here the first stage-coach started, and the first Lancashire newspaper was published. The principal buildings include the town hall; museum, library and art gallery; Parr Hall; county court house; school of art; grammar school (founded in 1526) and numerous philanthropic and educational institutions. The Manchester Ship Canal is here crossed by several bridges. Pop. (1901), 64,241.

Warsaw, the capital of Poland and of the province of Russian Poland, on the left bank of the Vistula, 320 miles E. of Berlin. Founded at an early date, it possesses a 14th-century cathedral, and superseded Cracow in importance in 1566. The old walls and gates still exist, and the city is

commanded by a strong fortress built by the Tsar Nicholas I. The suburb of Praga lying on the right bank of the river is also fortified. Fine new promenades and squares have been laid out, but the ancient quarters are irregular and mean. Among the public buildings are the Sigismund Palace (16th century), the Saxon Palace, the Casimir, Brühl and Radziwill Palaces, the university, the Greek cathedral, the Lutheran church and several synagogues. The Greek Archbishop is the Primate of Poland. The greater part of the trade of the country is centred here, and the annual fairs are largely attended. Iron and steel, plated silver, boots and shoes, hosiery, gloves, cloth-weaving and the making of carpets, chemicals, jewellery, pianofortes, carriages and machinery are the leading industries. Though Russia closed the university for many years, and exercises strict supervision over the press, intellectual life has never been quite stifled. Pop. (1901), 756,426.

War-Ships are now commonly Ironclads. The system of plating ships with iron was first tried by the French in 1855, but it was not put into practice until 1858. In most cases sea-going vessels have no masts or sails, and their armour is 16 to 18 inches thick.

Wart-Hog. [Pic.]

Warton, THOMAS, poet and critic, was born at Basingstoke, Hampshire, on January 9th, 1728, and educated at Trinity College, Oxford. Though he took holy orders and engaged in tutorial work, he devoted most of his time to research in English poetry, with, as afterwards appeared, fruitful results. His poem *The Triumph of Isis* (1749) was followed by *Newmarket: a Satire* (1751) and other efforts in verse and prose, but it was his *Observations on the 'Faery Queen' of Spenser* (1751) that first attracted general notice. Three years later he was elected Professor of Poetry at Oxford, and afterwards seriously laboured at his *magnum opus*, the *History of English Poetry from the Close of the Eleventh to the Commencement of the Eighteenth Century* (1774, 1778, 1781), which he did not live to complete. In 1785 he became Camden Professor of History at Oxford, and also succeeded William Whitehead in the Poet Laureateship. In the same year he published an admirable edition of John Milton's early poems. He died at Oxford on May 21st, 1793.

Warwick, the capital of Warwickshire, England, on the Avon, 20 miles S.E. of Birmingham. Dating from Saxon times, it figures in Domesday as a place of some size, and its castle, begun in the 14th century, gave it great importance in the feudal epoch. This magnificent structure is still the residence of the Earls of Warwick, and contains a fine collection of pictures and armour, and the famous vase from Hadrian's Villa at Tivoli. The parish church of St. Mary (Perpendicular), with its exquisite Beauchamp Chapel, the Leicester Hospital and the two ancient gates are interesting relics of the past, but most of the extremely picturesque town is modern. Pop. (1901), 11,889.

Warwick, RICHARD NEVILLE, EARL OF, the "King-maker," eldest son of Richard Neville, Earl of Salisbury, was born on November 22nd, 1428. On the outbreak of dissensions between the Houses of York and Lancaster he joined the former faction, contributing in no small degree to its triumph in the first battle of St. Albans (May 22nd, 1455). In the same year he was appointed Captain of Calais, but when the war was renewed in 1459 he again joined the standard of the Duke of York. In June, 1460, he landed at Sandwich and marched on London, Henry retreating before him as far as Northampton, where the royal forces were severely defeated (July 10th), and the king himself fell into Warwick's hands. At the close of the year Queen Margaret was victorious at Wakefield (December 31st), the Duke of York losing his life in the battle, and when Warwick endeavoured to intercept her march to London he suffered a severe defeat at St. Albans (February 17th, 1461). But the rapacity of the queen's northern troops excited the indignation of the Londoners, who willingly admitted the joint forces of Warwick and the young Duke of York. The latter now became king under the title of Edward IV., and the hopes of the Lancastrians were finally crushed on the bloody field of Towton (March 29th, 1461). When the king married Elizabeth Woodville, daughter of Lord Rivers, he played off her family against the Nevilles, and ultimately, in 1470, Warwick was forced to seek refuge in France. By the influence of Louis he was reconciled to Margaret, and an invasion of England in the Lancastrian interest was planned. Edward's flight to Burgundy was followed by the restoration of Henry VI., and Warwick was once more supreme. In the next year (1471), however, Edward returned and entered London, and after a hard-fought battle at Barnet in Hertfordshire (April 14th), Warwick was defeated and slain.

Warwickshire, a county of England, occupying an area of 880 square miles, bounded on the N. by Staffordshire, on the E. by the shires of Leicestershire and Northampton, on the S. by those of Oxford and Gloucester, and on the W. by Worcestershire. The surface is undulating and picturesque, well adapted for agriculture and grazing, whilst the timber is remarkably fine. The northern portion, once covered by the Forest of Arden, is now mainly devoted to manufactures, Birmingham, Coventry, Nuneaton and Tamworth being the chief industrial centres. Coal, iron, limestone and fireclay are worked in these districts. The south, to a large extent pastoral, is famous as a hunting country. Besides the towns mentioned above, there are Warwick, the capital; Leamington, noted for saline waters, which also claims to contain the spot known as the heart of England; Stratford-on-Avon, where William Shakespeare was born and died; and Rugby, the seat of the great public school. Pop. (1901), 897,678.

Wash, THE, the estuary of the Ouse, Nen, Weland and Witham, occupying a space some 22 miles long by 15 miles broad, between the counties of Norfolk and Lincoln, in the east of England. For

the most part it consists of shoals and quicksands, dangerous alike to travellers by land or water; but the Lynn Deep and Boston Deep give anchorage for vessels of moderate size. Much of the bed has been reclaimed.

Washington, a Pacific state of the American Union, bounded on the N. by British Columbia, on the E. by Idaho, on the S. by Oregon, and on the W. by the Pacific. It occupies an area of 69,180 square miles. Traversed inland by the Cascade Mountains and farther west by the Coast Range, its surface is very rugged. Mount Rainier attains 14,526 feet, Mount Baker 10,827, Mount St. Helens 9,750, Mount Adams 12,470, and Mount Olympus 8,150. The Columbia and its tributaries drain a large portion of the state, but there are many other rivers on either side of the watershed. Wheat, barley, oats, hay, maize, potatoes, hops, apples, peaches and other fruit all do well, and there are splendid tracts for grazing. Gold, silver and coal are the chief minerals. The forests are amongst the grandest in the United States. The industries include lumbering, flour-milling, the canning and preserving of fish, machine-making and shipbuilding. The fisheries, both river and sea, are of great importance. Olympia (4,082) is the capital. Settled in 1845 and organised as a Territory in 1853, Washington was admitted into the Union in 1889. Pop. (1900), 518,103.

Washington, the capital of the United States, in the district of Columbia, with which it is coterminous, on the left bank of the Potomac, 40 miles S.W. of Baltimore. Founded in 1790, the seat of government was transferred hither from Philadelphia in 1800. The British entered the city in 1814 and fired the Capitol and other public buildings. The city is regularly laid out in wide streets radiating from the Capitol, which contains the chambers of the Senate and Congress and the Supreme Court, and is a superb freestone structure with an iron dome, surrounded by a park of 35 acres. George Washington laid the corner-stone in 1793. The White House, the residence of the President, $1\frac{1}{2}$ mile distant, has larger grounds, and near it are the chief government offices. The Naval Observatory, the Smithsonian Institution, the Corcoran Art Building, and the Episcopal Cathedral at Mount Saint Albans, from designs by G. F. Bodley, R.A., and Henry Vaughan of Boston, are handsome edifices. Howard and Columbia Universities stand in the suburbs. The city is adorned with many statues, and besides markets, theatres, etc., has an arsenal, navy yard and accommodation for troops. There are few industries except glass-making and the manufacture of metallic wares, and the river trade is limited to the suburbs of Georgetown and Alexandria. Pop. (1900), 218,196.

Washington, GEORGE, the first President of the United States, was born in Westmoreland County, Virginia, on February 22nd, 1732. Little is known of his early life, but he was volunteer aide-de-camp to General Braddock, and fought in the disastrous battle of the Monongahela (July 9th,

1755). Three years later he led the advance-guard in the capture of Fort Duquesne, which was renamed Fort Pitt (1758). He was one of the delegates sent by the Virginia Convention to the first Continental Congress in 1774, and in 1775 was appointed commander-in-chief of the forces raised by the United



GEORGE WASHINGTON.
(After the painting by Stuart.)

Colonies to resist the Mother Country. After a siege of eight months he compelled the British troops to evacuate Boston (March, 1776); but in August he was defeated by Howe in the battle of Long Island and compelled to fall behind the Delaware. The advantages gained at Trenton (December 26th, 1776) and Princeton (January 3rd, 1777) saved Philadelphia for a while, but Howe made his way round by sea. A British victory at Chadds Ford (Brandywine, September 11th) was followed by the capture of the city, and Washington suffered a second defeat at Germantown (October 4th). On June 28th, 1778, he fought an indecisive battle at Monmouth Court House (now called Freehold). During the greater part of 1779 and 1780 he remained inactive, owing to the weakness of his army; but in 1781, having been appointed to the command of the Army of the South, he was enabled to direct the operations which resulted in the collapse of the British attack and the surrender of Lord Cornwallis at Yorktown (October 19th). On December 28th, 1783, he resigned his commission and retired to Mount Vernon, his place in Virginia, but in 1787 he was elected President of the Convention which drew up the national constitution, and two years later he became first President of the United States. At the end of his second term of office in 1797 he withdrew from public affairs. He died at Mount Vernon on December 14th, 1799.

Wasp, any species of the genus *Vespidæ*. The common wasp (*V. vulgaris*) is a native of Great Britain. Sexually it is of three kinds—males, females, and neuters—the two latter armed with a venomous sting. The neuters are the workers in the hive. Most of the workers and all the males die at the approach of winter.

Waste Book, a book containing a regular account of a merchant's transactions set down in the order of time in which they took place.

Watch-making originated in the early part of the 16th century, when the discovery of the mainspring rendered the construction of a pocket timepiece possible. The earliest examples had a verge escapement, without a balance-spring, and never can have been made to go at all regularly, even by the addition of a fusee to equalise the force of the mainspring as it unwound. Robert Hooke discovered, about 1660, that the addition of a properly arranged spring to the balance would make it have a definite time of vibration, and succeeding generations of watchmakers have found means of applying this discovery with astonishingly accurate results. The balance-wheel is a small fly-wheel, to the arbor of which is fixed one end of a flat spiral spring, the outer end of this spring being secured to the body of the watch. If such a wheel is turned from its position of rest and then left to itself, it will oscillate about its middle position, each successive swing diminishing in amplitude as the energy stored in the spring is used up in the friction of the pivots and in churning up the air. All these vibrations will be performed in nearly equal times, and by making the spring of a suitable shape they can be made almost exactly isochronous. The balance, therefore, provides a means for splitting up time into small equal intervals, but it is further necessary to supply it continuously with power to keep up its vibrations. This can be effected by one of the many kinds of escapements. It is found that the rate of a watch varies with changes of temperature, owing partly to the expansion and contraction of the balance-wheel, and partly to a variation in the elasticity of the balance-spring. The compensation balance is designed to remedy this defect.

Water is a mobile transparent liquid, which in a state of purity is almost colourless; when seen in sufficient bulk, however, it appears a bluish-green. This must not be confused with the intense blueness of some of the Alpine lakes, as this has been found not to be inherent in the water, but to be due to the presence of tiny particles of matter. Water is almost incompressible; it was found that in some experiments made by the Florentine Academy, where water was enclosed in hollow spheres of gold and silver, that the liquid oozed through the metal rather than be compressed. Later experiments, however, show that 1,000,000 volumes are diminished by 50 under a pressure of two atmospheres. Hence an ocean six miles deep has its surface lowered 620 feet by the compression due to its own weight, and the average sea-level is lowered 116 feet over the earth. Hence 2,000,000 square miles of land are now uncovered which would be submerged if water were incompressible. Water is an extremely bad conductor of heat; a piece of ice compelled to rest at the bottom of a thin glass test-tube full of cold water will remain unmelted for a long time, even though the tube be heated in the middle till the upper half of the water gets quite hot. Water heated at the base transfers its heat

to the surface by means of convection currents, the heated particles of liquid rising on account of their diminished density. Absolutely pure water is never found in nature, the nearest approximation being rain-water which has been collected during a heavy shower some time after its beginning. Water is separated from suspended impurities by filtration, but is only got quite pure by distillation. Distilled water is extremely insipid to the taste, on account of the absence of air. Water contracts on cooling till the temperature of 4°C. (39°F.) is reached; then it begins to expand, and continues doing so down to 0°C., at which point it freezes, and then further expands, so that 100 volumes of water become 109 volumes of ice. This sudden increase of volume causes the bursting of water-pipes, and plays a very important part in nature by disintegrating the rocks and soil. When ice is melted, a certain amount of heat is absorbed in the process without causing a rise in temperature. This is known as the latent heat of water, and is equal to 79.25 units of heat. A corresponding amount of heat is also absorbed when water is converted into steam, the latent heat of the steam at the boiling-point being 536 heat units. A curious effect can be obtained by sprinkling a few drops of water on to a very hot plate. They are found to assume a spheroidal shape, they do not touch the plate and they do not boil away; but if the temperature is allowed to fall, the drop begins to boil, touches the plate, and then suddenly bursts into steam and vanishes. This is known as the spheroidal state, and was investigated by Johann Gottlob Leidenfrost (1715-94), Professor in the University of Duisburg. Other liquids besides water exhibit the same phenomenon. Water is one of the best solvents known, and the solubility of almost all substances is greater in hot than in cold water. The presence of water in many solids alters their crystalline forms; this is known as "water of crystallisation," and its presence to a greater or less amount frequently alters the colour as well. Thus some almost colourless substances will assume a much darker tint if heated, so that they lose some of their water. Many such substances are used as "sympathetic inks." Liquid water at 4°, its point of maximum density, is taken as a standard for the measurement of specific gravity. Steam, however, is not the standard for gases, and its density is nine times that of hydrogen.

Water-Bears, or **BEAR ANIMALCULÆ**, are the members of the Tardigrada or group of Arachnida, allied to the Acarina or Mites. The group is characterised by having four pairs of short limbs, and no abdomen. They are minute in size, have a soft, cylindrical or elongated oval body, a pair of eyes, and jaws adapted for piercing and sucking. Macrobiotus is a typical genus. They live in damp moss, pools and the gutters of houses.

Water-Beetles, insects belonging to the family Dytiscidae, common in stagnant water and sluggish streams. Their form is oval, compact and boat-like and their hind legs have an oar shape. Their antennæ are, of necessity, smooth, since a hairy surface under water would interfere with the

ready transmission of impressions through the organs by the collection of air bubbles on their surface.

Water-Brash. [PYROSIS.]

Water Clock, or CLEPSYDRA, a simple instrument used by the Greeks and Romans for measuring time. Though not of such antiquity as the sundial, it nevertheless was used in the earliest times, and in Babylonia and Egypt formed the clock of the astronomers. In 145 B.C. Ctesibius of Alexandria improved the water clock by adding to it a system of wheels; these moved a small figure which pointed out the hours.

Water-Colours are pigments which for use are ground up with water, a little gum or gelatine being added, if necessary, to give a required consistency. The colours are usually far more transparent than oil-colours, and employed in a totally different fashion. For storing they are generally kept as hard cakes, or mixed with water and a little gelatine in collapsible tin tubes.

Watercress (*Nasturtium officinale*), a British creeping perennial aquatic member of the order Cruciferae, valued as a pungent salad plant, appetising and antiscorbutic. The South American *Tropaeolum*, known as "Nasturtium" in gardens, is in no respect related to it save in flavour. The watercress has smooth, shining, pinnate leaves, with seven to thirteen ovate leaflets, the terminal one considerably the larger. The flowers are small, white, and in a corymbose raceme, and the stalks are hollow.

Waterfall. A true waterfall is to be distinguished from a water-slide, where the river merely dashes down a steep slope without ceasing to be in contact with the ground, and from a cascade, where a mountain torrent leaps over a pre-existent rock-ledge; for the true waterfall is probably always the work of the river itself, which, passing from one rock on to the outcrop of a softer one, wears away the latter more rapidly. A ravine or gorge is thus formed, with the fall at its head, and this fall will, by the erosive action of the river, retreat steadily up stream. The swirl of water below the fall frequently hollows out a pool and leaves a projecting ledge, over which the water dashes until it breaks away. The "chines," "glens," or "bunnies" of the south coast of England are miniature examples of the formation of waterfalls.

Water-Flea. [DAPHNIA.]

Waterford, a county in the province of Munster, Ireland, bounded on the N. by Tipperary and Kilkenny, on the E. by Wexford, on the S. by the Atlantic and on the W. by Cork. It covers an area of 717 square miles and has a coastline of about 50 miles, deeply indented by the harbours of Waterford and Dungarvan, and the bays of Tramore and Youghal. The Comeragh and Knockmeledown Mountains, with the Drum Hills, occupy two-thirds of the surface, but the land is level and marshy to the east. The Blackwater is the principal river. Oats, potatoes and turnips are the chief crops. The minerals include copper,

lead, iron and coal, but the first-named alone is of commercial importance. The breeding of cattle and swine and dairy-farming are the chief industries, butter and bacon being largely exported, but the fisheries are valuable, and brewing, distilling, flour-milling and cotton manufactures are carried on. Pop. (1901), 87,187. WATERFORD, the capital, stands on the Suir, 6 miles above its confluence with the Barrow, the estuary forming a splendid haven 15 miles long by $2\frac{1}{2}$ broad. Pop. (1901), 26,769.

Water-Glass. [MURAL DECORATION.]

Water-Hen. [MOOR-HEN.]

Water-Lilies, a general term practically including the whole of the thalamifloral Natural Order Nymphaeaceae, i.e., some sixty species belonging to eight genera, which inhabit the waters of temperate and tropical regions. They are perennial, with a starchy rhizome embedded in the mud, and leathery, orbicular, involute leaves, often floating and sometimes peltate. Both petioles and peduncles contain large air-spaces with remarkable internal hair-cells. The sepals, petals and stamens of the large, beautiful and often fragrant flowers are all free and hypogynous, and frequently exhibit very gradual transitions from the one to the other. They have several carpels, generally surrounded by a fleshy adnate disc, with radiate stigmas and ovules scattered over the inner surfaces of the ovarian chambers. The seed has both perisperm and endosperm, separated by a persistent embryo-sac, which was at one time mistaken for a cotyledon, and so led to the order being considered monocotyledonous. The flowers may be white, yellow, pink, or blue. The white water-lily (*Castalia speciosa*) and the yellow water-lilies (*Nymphaea lutea* and *N. pumila*) are British.

Waterloo, a village of Belgium, 12 miles S.S.E. of Brussels, famous as the scene of the battle, on June 18th, 1815, in which the Duke of Wellington and Marshal Blücher defeated Napoleon. On the field has been raised a huge mound, 200 feet high, on the top of which stands a colossal lion. Several places familiar to the reader still exist, such as the château of Hougoumont and the farmhouses of La Haye Sainte, Mont St. Jean and La Belle Alliance. A light railway crosses the plain, and the nearest railway station is Braine l'Alleud.

Water-Mites, a family of Acarina known as the Hydrachnidae, the members of which are parasitic on water-beetles.

Water-Power. [HYDRAULICS.]

Water-Pressure. [HYDRAULIC PRESS.]

Water-Scorpions, members of the family Nepidae, belonging to the class of insects known as Heteroptera. They obtain their popular name from the facts that the pair of front legs are jaw-like in appearance and are kept in advance of the head, and from the possession of a long pointed tail, so that they somewhat resemble scorpions. They live in pools and are often 2 to 3 inches long. The type-genus is *Nepa*.

Watershed, or WATER-PARTING, the dividing-line between the drainage-areas or basins of two rivers. This line is very often a ridge of high ground, but not necessarily so. Several of the largest rivers in Europe—those of Russia, for example—radiate from swampy ground but little elevated above sea-level; nor is the central watershed of North America very elevated. The rivers of the south of Ireland and those of the south-east of England cut ravines through ground higher than their present sources. This is due to alterations in the levels of the land by subaerial denudation since the rivers began to flow in their present courses.

Waterspout, a violent gyration of air or tornado occurring over the sea, in which atmospheric pressure is so reduced that the sea is violently agitated and heaped up, whilst the black cloud overhead projects downwards like an inverted cone. As the central column of air is further rarefied its moisture is condensed as water, thus completing the column. Tornadoes originate after calm sultry weather, when the air is very moist. They gyrate in a direction opposite to that of the hands of a watch, and travel—in an easterly, generally north-easterly, direction—at rates varying from 12 to 60 miles per hour, with a path from 13 to over 3,000 yards wide, and with a deafening noise. The damage done by them on land is largely owing to the explosion of buildings from the rarefaction of the air surrounding them.

Watford, a town of Hertfordshire, England, on the right bank of the Colne, 15 miles N.W. of London, of which it may almost be described as a residential annexe. The chief buildings are St. Mary's Church, the London Orphan Asylum, School of Art, Public Library, County Court House, Literary Institute and the Salters' Company Almshouses. Bushey, on the left side of the river, is a well-known resort of artists, the vogue having been set by Sir Hubert Herkomer, R.A., who founded his school here in 1883. Pop. (1901), 29,023.

Watson, JOHN, novelist and divine, better known under his pseudonym of IAN MACLAREN, was born at Manningtree, Essex, on November 3rd, 1850, and educated at Stirling Grammar School, the University and New College, Edinburgh, and the University of Tübingen. Ordained a minister of the Free Church of Scotland in 1874, he was successively minister of Logiealmond (1875), Free St. Matthew's, Glasgow (1877), and Sefton Park, Liverpool (1880-1905). He was Lyman Beecher lecturer at Yale University in 1896, and Moderator of the English Presbyterian Church in 1900. After the appearance of *Beside the Bonnie Brier Bush* in 1894 his novels enjoyed a great vogue. Amongst others were *The Days of Auld Lang Syne* (1895), *Kate Carnegie and those Ministers* (1896), *A Doctor of the Old School* (1897), and *His Majesty Baby* (1902). His serious works included *The Upper Room* (1895), *The Mind of the Master* (1896), *The Life of the Master* (1901), and *The Inspiration of Faith* (1905). During a lecturing tour in the United States in 1907, he was suddenly taken ill at Mount Pleasant in Iowa, where he died on May 6th.

Watt is a unit of rate of doing work, and is equal to $\frac{1}{746}$ horse-power. It is found a convenient unit by electricians, as it expresses the rate at which work is done by a current of 1 ampère flowing in a circuit of 1 ohm resistance; so that the power developed in watts in any circuit is obtained by multiplying the current in ampères by the difference of potential in volts. The power expended in a glow-lamp, for instance, is said to be, say, 60 watts; and in the case of dynamos, where the numbers would be inconveniently large, the kilowatt (= 1,000 watts) is often used. One watt is equivalent to 10^7 ergs in the C.G.S. system.

Watt, JAMES, engineer, was the son of a merchant at Greenock, Renfrewshire, where he was born on January 19th, 1736. His education was much interrupted by ill-health, so that his knowledge was mostly self-acquired. His weakly constitution also prevented him from remaining in London, where he had become apprenticed to a mathematical instrument maker in his nineteenth year. Baulked by the jealousy of the Corporation of Hammermen in his design of settling in business at Glasgow, he secured the patronage of the University professors, who in 1757 made him mathematical instrument maker to the University. In 1763, however, he established a business of his own. Entrusted with the repair of a model of Thomas Newcomen's engine, he devised the expedient of the separate condenser, thereby economising steam and fuel (1765), and went on to substitute steam for atmospheric pressure as the motive-power by making the former act directly on the piston introduced into the cylinder. In 1775 he entered into partnership with Matthew Boulton, owner of the Soho Engineering Works, Birmingham. His further improvements included the crank and fly-wheel, the double-acting principle, parallel motion, the smokeless furnace, and the regulating action of the governor. He died at Heathfield Hall, near Birmingham, on August 25th, 1819.

Watteau, JEAN ANTOINE, painter, was born at Valenciennes, France, on October 10th, 1684. Leading a youth of great hardship he made his way to Paris, where his artistic talent procured him employment under Gillot, whose studio he entered in 1703. Five years later he became the assistant of Audran, keeper of the Luxembourg, with whom he remained for two years. By now he had found his true line in his profession as a painter of *Fêtes Galantes* and other scenes of *al fresco gaiety*. His masterpiece "*L'Embarquement pour l'île de Cythère*" appeared in 1717. In 1719 he visited England, where he sojourned for two years. He died in Paris on July 18th, 1721. Watteau was a brilliant draughtsman, a charming composer and a fine colourist.

Wattle, the fleshy lobe that grows under the throat of the domestic fowl.

Wattle. [ACACIA.]

Watts, GEORGE FREDERICK, painter and sculptor, was born in London on February 23rd, 1817. His artistic gift was precocious and he entered the Royal Academy Schools. In 1837 he

exhibited at the Royal Academy for the first time, and soon made his mark as a painter of portraits and of historical subjects on the grand scale. He had gained two of the principal prizes offered for the decoration of the Houses of Parliament. In 1867 he was elected A.R.A., and in December of the same year was promoted to full membership. This was in his case an exceptional honour, since he had declined voluntarily to become a candidate and the Academy had relaxed its own rule in his behalf and to its advantage. Watts continued during many years to produce works, on the highest scale of excellence, both in portraiture and allegory. Many of the former are to be seen in London in the National Portrait Gallery, and of the latter in the Tate Gallery, to both of which institutions he was a most generous benefactor. "Love and Life," "Love and Death," and "Orpheus and Eurydice" are perhaps his most admired achievements in the field of imagination. He showed almost equal talent in sculpture and, had he had the ambition or desire, would certainly have been President of the Royal Academy. He died at Kensington on July 1st, 1904. He was the greatest exponent of the noble style of workmanship since Sir Henry Raeburn.

Watts, ISAAC, hymn-writer and divine, was born at Southampton on July 17th, 1674, and studied for the Dissenting Ministry in Thomas Rowe's Academy at Stoke Newington. In 1698 he was chosen assistant to Dr. Isaac Chauncy, minister of the Independent Chapel in Mark Lane, London, succeeding him four years later. He died in London on November 25th, 1748, and was buried in Bunhill Fields. His name endures as the author of *Hore Lyrica* (1706), *Hymns* (1707), *The Psalms of David* (1719) and *Divine and Moral Songs*, an enlargement of his *Divine Songs*, the first children's hymn-book, published in 1715. Three of Watts's Hymns, "When I survey the Wondrous Cross," "O God, our help in ages past," and "Jesus shall reign where'er the sun" are among the noblest in the language. Other esteemed works of his were *Logic* (1725), *Catechisms* (1730), *Scripture History* (1732) and *The Improvement of the Mind* (1741).

Waves and Wave-Length. Wave motion is such that consecutive particles in the medium through which the wave is passing undergo, one after the other, a similar series of movements, each particle coming to rest when the wave has passed it. There is thus no transference of matter along the wave, but only transference of motion. It is seldom that we are able to deal with a single wave; generally a number of waves succeed each other, the particles repeating their series of movements for each fresh wave which passes it. Sea-waves are formed in the above manner, but particles may move in many other than circular paths, the form of the wave naturally differing in consequence. If the path is reduced to a straight line at right angles to the direction in which the wave is travelling, we have what are called transverse vibrations, and the particle is moving with a simple harmonic motion. If the path be a straight line

in the direction of the wave, we have again simple harmonic motion, but the vibrations are known as longitudinal. Longitudinal vibrations are of interest, since sound is transmitted by them through matter. In this case the waves do not appear in the familiar form of crests and troughs, but are shown as successions of compression and rarefactions. [SOUND, Fig. 2.] Transverse vibrations are important in the study of the transmission of light and other radiations through the ether. If a particle be made to move under the action of two or more simple harmonic motions its path can be quite simply found, and the shape or the curve so obtained depends on the period of each oscillation, on the amplitude and on the difference of phase. In this way an infinite variety of curves can be obtained, representing the resultant motion of a particle, and many instruments, known as harmonographs, have been constructed actually to draw the curves.

Wax is used to denote a large number of substances all more or less allied in their properties and chemical composition to beeswax, as, *e.g.*, Chinese wax, spermaceti, etc. They are all solid bodies, fairly hard when cold, but softening when warmed, and melting below or near 100°. In their chemical composition they are organic ethereal salts, *i.e.*, compounds of organic salts with alcohols, both acid and alcohol being usually rather complex and containing many carbon atoms in the molecule. They are obtained chiefly from vegetable sources, and are much used in making candles, fancy articles, toys, etc., and in medicine as an emollient.

Wax-Bill (*Estrela astrilda*), a small South African finch, a favourite cage-bird.

Waxwing, any of the three species of the Passerine genus *Ampelis*. The secondaries, and sometimes other feathers, end in horny expansions like pieces of red sealing-wax. The Bohemian Waxwing is *A. garulius*, and the Japanese Waxwing *A. phoeniceus*. [CEDAR-BIRD.]

Waxy Degeneration. [AMYLOID DISEASE.]

Ways. There are four kinds in the United Kingdom: (1) a footway; (2) a horse and footway, called also a pathway; (3) a cartway (including a foot and horse way); (4) a driftway, *i.e.*, a way for driving cattle. Ways are either public or private, the former being open to all subjects of the realm, the latter open only to the inhabitants of a particular parish, village, or house. A public way is also generally known as a highway. It is commonly assumed that every highway is the sovereign's, but this means that the sovereign and his subjects have at all times the right to pass and repass only at their pleasure, for the freehold and all the profits thereof belong to the lord of the soil, being usually the adjoining owner, who, therefore, may maintain trespass for digging in the highway. A public way need not be a thoroughfare, nor is a thoroughfare of necessity a public way. The dedication of a public way is readily presumed from user as such, *e.g.*, from six to eight years' user. But a highway may also exist by express grant.

It most commonly exists in virtue of some Act of Parliament.

Wealden Beds, a great series of mainly freshwater beds, some 1,900 feet thick, belonging to the Lower and Middle portions of the Neocomian or Lower Cretaceous system, which take their name from the Weald, or ancient forest area, of Sussex, Surrey and Kent. These beds extend from Poole in Dorsetshire and Brook in the Isle of Wight, under both the South and North Downs, to the Boulonnais, and probably represent the delta deposits of a large river coming from the north and west. They pass insensibly downwards, as in the Battle, Fairlight, and Purbeck areas, into the underlying Purbeck beds, and upwards, with but little break, into the Atherfield Clay, the lowest division of the marine Lower Greensand (Upper Neocomian) series. The entire series is subdivided into the Hastings Sands and the Weald Clay, and between the North and South Downs, where the whole Cretaceous system is in an anticlinal fold, not only the once-overlying dome of Chalk, but in the centre of the area the Weald Clay also, has been removed, thus exposing the Hastings Sands in the undulating woodland region of St. Leonards and Ashdown Forests. The Hastings Sands is subdivided into—Upper Tunbridge Wells Sand; Grinstead Clay; Lower Tunbridge Wells Sand; Wadhurst Clay; Ashdown Sand. It was in these beds that iron ore was formerly extensively worked in Sussex and adjoining districts.

Weasel (*Mustela vulgaris*), a common British carnivorous mammal of the same genus as the Stoat. The total length is rather under a foot, of which the tail counts for about a third. The fur is reddish-brown above and white beneath; but in cold countries the whole pelage becomes white in winter. Weasels feed on mice, rats, small birds and frogs.

Weather. It was not until recent times that the old-fashioned "signs" received any scientific explanation, for the science of meteorology is of recent growth. Since about 1870 the use of "synoptic charts" has much facilitated the forecasting of weather. On these charts the height of the barometer is recorded at a specified time in a number of places over a large area. Lines are drawn through places of equal barometric pressure, and are known as isobars. Isothermals are also drawn through places of equal temperature, while arrows indicate the direction and force of the wind, and other symbols are used to denote the appearance of the sky, the kind of clouds, the occurrence of mist, rain, or snow, and other important details. From a study of such charts it has been found that the wind always blows in a particular direction with regard to the position of minimum pressure, and its force is greater the nearer the isobars are together. The isobars have also been found to group themselves into about seven fundamental shapes, and each shape brings its own particular kind of weather—mists, rain, clouds, blue sky, and so on. The whole isobaric areas are constantly moving onwards, so that place after place enjoys the same succession of

weather detail. Hence, if we can tell—as in many cases we can—which way such an area travels, we can predict with some certainty the weather of different places in its path. Perhaps the two best-known isobaric shapes are the cyclone and anticyclone—the one being the exact reverse of the other. In a cyclone the isobars are closed oval curves, the outer one showing a higher pressure than the inner one. As it moves onwards places in front of it have a falling barometer, and in its rear the barometer rises. The line joining places whose barometers have all just recorded their lowest points is called the "trough" of the cyclone. Roughly speaking, in the northern hemisphere the wind blows round the centre of the cyclone in a direction opposite to that of the hands of a watch. All places in front of the cyclone's trough get muggy weather, gloomy sky, stratified clouds, and possibly rain; all behind the trough have a clear sky, cool fresh air, and the clouds are of the heavy cumulus type. Near the centre of the cyclone is rain or drizzle; at the front there is seen a pale moon and watery sun, always considered as foreboding bad weather, and we now see why. The front of a cyclone also showing a falling barometer, we see why the latter is taken as a sign of rain. What sequence of weather will pass over a place is determined by the position the place occupies in the cyclone, and the direction in which the latter is moving. It may enjoy all the variety which the cyclone is capable of giving, or may merely have a few effects near the edge. Sometimes a cyclone is followed by a "secondary cyclone," and in this case the blue sky following the former is rapidly clouded and a steady downpour of rain sets in, little change being shown by the barometer. The centre of an anticyclone is an area of high pressure, the surrounding isobars being almost circular and far apart. An anticyclone is generally stationary for some time, the air being cold in the centre, and winds circulating in the outer portions in the same direction, in the northern hemisphere, as the hands of a watch. In summer the central part of an anticyclone is characterised by a hot sun, heavy dew, mist and calm; while in the winter the mist and calm give rise to fog. An anticyclone, on account of its steadiness, means settled good weather, but east winds prevail to the south of it.

Weathering, the geological term for the combined effect of atmospheric action upon rocks. This action consists chiefly in (1) sudden changes, or rapid alternations of temperature, such as those between day and night in extremely continental climates; (2) alternate saturation by rain and desiccation by sun; (3) frost; (4) surface evaporation in rainless areas; (5) hydration by atmospheric moisture; (6) the mechanical action of rain; (7) the erosive action of blown sand; and (8) the action of atmospheric carbon dioxide. The first of these splinters hard rocks by alternately expanding and contracting them. The second specially disintegrates shales and clays. The third is one of the most important weathering agents, as it causes the interstitial water of surface rocks to expand 10 per cent. The fourth action results in the forma-

tion of the saline efflorescences characteristic of those areas. The fifth shows itself in the rust-stains on rocks containing iron and in the conversion of anhydrite into gypsum. The sixth, an important and obvious agency, besides its everyday action seen in turbid streams and accumulations of rain-wash, has formed the curious earth-pillars of Tyrol and elsewhere. The eighth action is seen in the effacement of inscriptions on limestone, in the hard water and red clay residue in limestone areas, and in the rotting of the felspar of granite.

Weaver-Bird, a popular name for any species of the Passerine family Ploceidae, finch-like birds, found in the warmer parts of the Old World, and absent from Europe and America. Their popular and scientific names refer to their manner of constructing their nests. The plumage of the males is brilliant. The Baya Weaver-bird (*Ploceus baya*), a well-known Indian species, builds a nest something like a retort with the bulb uppermost, the entrance being at the bottom. There is a second chamber, and the structure is generally fixed to the branches of trees, often over water. The Social Weaver-bird (*Philetærus socius*), from Africa, builds in company. A roof-like structure is made in a tree by a number of these birds working together, and under this the nests are made side by side, like the cells of a honeycomb. The Mahali Weaver-bird (*Ploceus taha*) is said to defend its nest with thorns pointing outwards.

Weaving, the art of making cloth by the intersecting of two sets of threads. The threads or yarns which run parallel to the length of the cloth are known as the warp, and the weft intersects these at right angles. The warp threads are wound up on a cylinder known as the warp-beam, which works in bearings in the frame of the loom, and are drawn off as required. Each of these threads is passed through an eye in a "heddle," which is a frame supporting a number of such eyes. There are at least two heddles, alternate threads being passed through the eyes of each. The heddles may be raised or lowered by treadles in the case of a hand-loom, and the act of raising one lowers the other. Alternate threads can thus be lifted up or depressed as required. Near the heddles is a "reed," consisting of two bars joined by a number of flat strips of metal; the warp threads pass between these strips. The weft is wound in a shuttle, and this can be thrown across the loom immediately in front of the reed and between the two sets of warp threads when the latter are held apart by the heddles. A weft thread is thus introduced alternately under and over the warp threads, and if the position of the two heddles is now reversed and the shuttle again thrown, a second thread will be placed over and under those threads which it was previously under and over. At each throw of the shuttle the reed is brought forward, and pushes each new weft thread close up to the last. The cloth, as it is made, is wound up on a second roller or "cloth beam." Such a loom suffices for making plain cloth, such as calico, but no patterns can be produced save those due to the use of various coloured threads, which are limited to simple

stripes. To produce more complicated patterns the warp must be divided into more than two portions, necessitating a number of heddles; then variations from the simple alternate crossings of the threads are possible. All the movements of a loom may be, and until recent years were, performed by hand; but now automatic devices, operated by steam or other power, are applied to throw the shuttle, move the reed, and wind up the cloth, in addition to working the Jacquard apparatus. In making some fabrics the warp threads are half-twisted round each other in alternate directions between each passage of the shuttle, whereby a gauze is produced. In the case of pile wires are introduced at intervals between the warp threads, which, being subsequently withdrawn, leave a series of loops. These loops are cut in the case of velvets, etc.

Weber, KARL MARIA FRIEDRICH ERNEST VON, composer, was born at Eutin, near Lübeck, on December 18th, 1786. He received the best part of his musical training from Heuschkel, of Hildburghausen, Michael Haydn, of Salzburg, and Kalcher, of Munich, and at the age of twelve produced an opera and other music showing remarkable promise. In 1800 he composed another opera, *Das Waldmädchen*, which was performed with fair success at Munich and other cities. After completing his training in Vienna, he became (1804) conductor of the opera at Breslau, which he left in 1806 to become private secretary to the brother of the King of Würtemberg. His father being accused of misappropriation of the ducal money, the Webers were banished the country in 1810. Next year Karl Maria Weber brought out *Abu Hassan* successfully at Munich, and in 1813 was appointed director of the opera at Prague, and whilst there wrote his famous melodies for Körner's songs and other things equally good. Obtaining the directorship at Dresden, he went thither in 1816, and there composed his greatest works, *Der Freischütz* (1822), *Preziosa* (1822), and *Euryanthe* (1823), and died in London on June 5th, 1826, about two months after *Oberon* had been brought out. His writings for the pianoforte are admirable and deservedly popular.

Webster, DANIEL, statesman, was born at Salisbury (now Franklin), New Hampshire, where his father was a farmer, on January 18th, 1782. He worked on the farm during his boyhood, but was in later years enabled to attend an academy, and in 1797 entered Dartmouth College, from which he graduated in 1801. In 1805 he was called to the bar, and began to practise, at first at Boscawen, but later in Portsmouth, New Hampshire. He almost at the same time entered public life as a politician, speaking at meetings and strongly supporting the Federalists. In 1813 he entered Congress, where his great eloquence made him one of the leaders of his party. He settled in Boston (1816), where he became one of the most notable lawyers. In 1820 his fine speech on the Pilgrim Fathers, and in 1824 his oration on the Greek Revolution, established his right to be considered the foremost orator in America. In 1827 he was

named a member of the Senate, and in 1830 enjoyed the oratorical triumph of his life, when he smashed, pulverised and destroyed Robert Y. Hayne, J. C. Calhoun and the nullificationists who then began to advocate the theory of State rights that afterwards threatened the existence of the Union. In the same year, in conjunction with Henry Clay, he formed the Whig party which held a tremendous sway in American public affairs for twenty-two years. From 1841 to 1843 he was Secretary of State for Foreign Affairs, and almost secured the Presidency on two occasions. He died at Marshfield, Massachusetts, on October 24th, 1852.

Webster, JOHN, one of the greatest of the Elizabethan dramatists, by virtue of his extremely fine and powerful play, *The Duchess of Malfi*, is still a mystery to the literary historian, so far as his biography is concerned, though it is believed that he was born in London about 1580, and died in London about 1625. Scarcely anything whatever is known of his life beyond that he was clerk to the parish of St. Andrew's, Holborn. He published his first play, *The White Devil*, in 1612, his only previous writing having been done in conjunction with other dramatists. This was followed up by *Appius and Virginia*. Webster's genius for tragedy reached its highest point in *The Duchess of Malfi*, first played in 1616 and published in 1623.

Wedge is a solid body which is thinner at one end than the other. If the thin end be inserted into a fissure in a rock, for instance, force applied at the thick end drives the wedge farther in, enlarges the crack, and so splits the rock into two. In investigating the ratio between the actual force applied and the resistance overcome, it is usual to consider that both wedge and rock are perfectly smooth—an impossible case. In practice these conclusions are much modified owing to friction, especially in the case of a long thin wedge, such as is generally used. This, of course, reduces the efficiency of the machine. In engineering taper pins and "keys" are wedges so constructed that the friction is sufficiently great to retain them firmly in place. Pins, needles, chisels, choppers, axes and many other sharp-pointed instruments are common forms of wedges.

Wedgwood Ware. The first Wedgwood ware may be regarded as formed in 1759, when Josiah Wedgwood (born in Burslem, Staffordshire, in 1730; died at Etruria Hall on January 3rd, 1795), after much laborious work and experiment, succeeded in manufacturing a white or cream-coloured ware, with a fine lustre, and capable of withstanding sudden heat. It obtained him (1762) the title of "royal potter," and was known as queen's ware. He, however, perfected the manufacture of pottery to a much greater extent, and after the discovery of several fine coloured or white wares, he succeeded in obtaining (1777) the well-known and prized jasper ware, for which he was chiefly famous. This was a beautiful delicate ware, which could, by the addition of various metallic oxides, be coloured throughout its whole mass. By means of this ware he produced imitations of many gems,

cameos and intaglios, pure white reliefs being obtained upon the coloured base. He also rediscovered the long-lost art of painting upon ware, so that the resulting product did not possess the usual glossy surface. Besides the high technical excellence and beauty of the ware the manufacturer ensured a high degree of artistic excellence by securing the co-operation of the artist John Flaxman and the careful selection of skilful workmen. His works were situated at the village of Etruria, and this word is added to the usual mark "Wedgwood" upon the ware.

Wednesbury (locally, WENSBUURY), a town of Staffordshire, England, 8 miles N.W. of Birmingham. The Perpendicular church of St. Bartholomew occupies the site of a temple to Woden, whence arose the name of Wodensborough. Other buildings include the Town Hall, Art Gallery and Free Library. Coal and iron are mined in the vicinity and the manufactures comprise iron and steel, bridges, cranes, boiler-plates, rails, axes and edge-tools, and water-, gas- and steam-pipes. Pop. (1901), 26,544.

Weever, a genus (Trachinus) of Acanthopterygian fishes, of which two, the Greater (T. draco) and the Lesser Weever (T. vipera), are British. They are sometimes called Sting-fishes, from the fact that they can inflict severe wounds with the grooved spines of the dorsal fin and gill-cover.

Weevils, a section of beetles known as the Rhynchophora, characterised by having the body cylindrical, the head prolonged into a point or rostrum, and intensely hard horny wing-covers or elytra. The weevils are usually small, inconspicuous beetles, and there is a very large number of species of them, which are grouped into three families. One of the best-known members of the group is *Balaninus nucum* (Linn.), the Nut Weevil. The grub of this is small and white, and lives in nuts and acorns; the beetle is black with red legs, and is about a quarter of an inch in length. The Corn Weevils are the most destructive; they are about half the size of the Nut Weevil. The grubs live in corn grains, and they reproduce so rapidly that they commit serious depredations in granaries. *Calandra granaria* and *C. oryzae* are the two best-known species. The Pea Weevil (*Bruchus pisi*) is another familiar species. The largest and most beautiful members of the group are the Diamond Beetles. Some of these are over an inch in length. The most beautiful species, and one which is familiar as a microscopic object, is *Entimus imperialis* (Forster) of Brazil.

Weight is the force which, acting on a body, tends to make it fall to the earth. When a body falls freely, it gains in every second a velocity of about 32 feet; hence, if we take as our unit force that force which generates in one pound an acceleration of one foot per second, the weight of a pound will be thirty-two times this unit, or thirty-two poundals. The acceleration due to gravity is not the same at all points on the earth, it being greater at the poles than at the equator. The weight of a pound is thus not always 32 poundals,



WEDGWOOD WARE.

JASPER VASE.

but depends upon its position; so also the weight of a gramme may vary between 978 dynes at the equator and 983 dynes at the pole. It is thus seen, that whereas the mass of a body is a perfectly unalterable thing, its weight is something which depends on circumstances. At the same spot the masses of two substances are proportional to their weights; hence we can correctly say that the mass of one substance is equal to that of another when their weights are the same as indicated by an ordinary balance.

Weights and Measures were undoubtedly in use from the very earliest times. Before the Conquest the standard of weight was the pound, known later as the Tower pound, and this remained as one of many pounds in use till it was abolished as a legal weight at the Mint by Henry VIII., who legalised Troy weight for the weighing of gold and silver. The commercial pounds of early days became gradually superseded by the avoirdupois pound, of which Edward III. had a standard; and the pound of the present day is practically equivalent to that standard, although intermediate standards have been made by Henry VII. and Elizabeth. The standards made in 1588 are still in existence, and were used till 1824. The old standards of capacity—the bushel and gallon—varied from reign to reign, and were all abolished as standards in 1824, when the Imperial gallon was made to contain 10 lbs. of pure water. In 1758 a Committee of the House of Commons was appointed to consider the weights and measures of the land. They caused a new standard yard and pound Troy to be made in 1760, but none of their suggestions was carried into law till 1824. In this year the two standards which had been put aside were legalised as the “Imperial standard yard” and “Imperial standard pound Troy.” They were, however, left in the House of Commons, and were destroyed in the fire of 1834, and a Commission was appointed in 1843 to consider their restoration. In 1854 the Commission presented its report, and new standards were made. The yard was redetermined, but the new standard of mass was now the pound avoirdupois instead of Troy, and it was to weigh 7,000 grains in vacuo, whereas the pound Troy had weighed 5,760 grains in air. The new standard pound avoirdupois was made of platinum and was constituted the new Imperial standard pound. The Imperial yard was registered on a bronze bar, the distance between two scratches on gold plugs indicating the actual yard. In 1855 the Imperial standards were deposited in the office of the Exchequer. When the Standards Department was created, the Imperial standards were given over to the care of the Warden of the Standards. Parliamentary standards—copies of the Imperial—are kept at the Royal Mint, Royal Society, Royal Greenwich Observatory, and in the Houses of Parliament at Westminster.

Weimar, the capital of the Grand Duchy of Saxe-Weimar, is picturesquely situated in a hilly district, on the left bank of the Ilm, 13 miles E. of Erfurt. The opera-house and theatre still retain much of their old prestige. The Grand Ducal

library contains 140,000 volumes and many objects of interest. The principal buildings are the Goethe National Museum (formerly the poet's house), Schiller's house, the Stadt-Kirche (in which Herder was buried), the Grand Ducal Palace, Town Hall, the Belvedere, the Museum, Liszt Museum and Technical School. Goethe and Schiller lie in the Grand Ducal vault in the cemetery. Pop. (1905), 31,117.

Weismann, AUGUST, biologist, was born at Frankfort-on-Main, Prussia, on January 17th, 1834, and studied medicine at Göttingen and biology at Giessen. He became in 1860 physician to the Archduke Stephen of Austria. His chief works are *Ueber die Berechtigung der Darwin'schen Theorie* (1868), *Studien zur Descendenztheorie* (1876), *Heredity and Kindred Problems* (1889), *The Germplasm or Theory of Heredity* (1893), and *The Evolution Theory* (1904).

Welding, the union of two pieces of metal by hammering or pressing together. The capability of being welded is possessed by but few metals. Iron at a red heat passes into a soft state at which it can be readily welded by pressure, a property of the utmost importance in the working of iron, and hence in the general industries, as without it the manufacture of many parts of machinery, etc., would be almost if not quite impossible. Lead and gold finely divided may, without heat, be welded into a coherent mass, and platinum also at a high temperature is worked by welding. Within recent years various modes of electric welding have been employed.

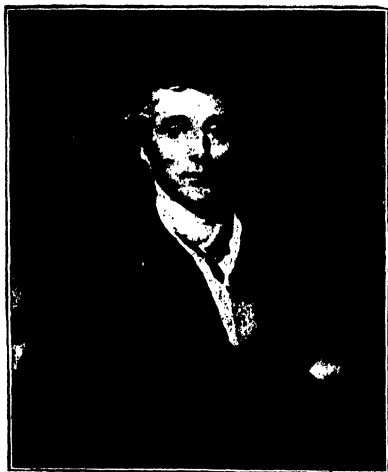
Wellesley, RICHARD COLLEY, MARQUIS, statesman and administrator, the eldest brother of the Duke of Wellington, was born in Dublin on June 20th, 1760. He received his education at Eton and Christ Church, Oxford, and was noted for his skill as a Latin verse-writer. Entering Parliament as member for Beer Alston in Devonshire, his capacity soon became evident, and in 1797, when he was made a peer, he was appointed Governor-General of India. His services to Great Britain in this post proved him one of the strongest administrators ever sent to India. Under his rule he ended French influence in India, and reduced the power of the Marhattas. He became Foreign Secretary in 1809, and Viceroy of Ireland in 1821 and again in 1833. Unlike his distinguished brother, he was a firm supporter of Catholic Emancipation. He died at Kingston House, Knightsbridge, London, on September 26th, 1842.

Wellingborough, a town of Northamptonshire, England, on a hill near the junction of the Ise with the Nen, 10½ miles N.E. of Northampton. The chief buildings are St. Luke's Church, containing Norman, Early English and Decorated work, and a fine Perpendicular screen; the Grammar Schools, founded in 1595, and extended and enlarged in 1876-80; the Corn Exchange, and the Literary and Scientific Institute. The industries include, as a flourishing speciality, the making of boot and shoe uppers, iron-smelting, iron-founding and brewing. The town owes its name to the

chalybeate springs, once noted and resorted to by Charles I. and Henrietta Maria in 1626. Pop. (1901), 18,412.

Wellington, a province and its capital in the south-west of North Island, New Zealand. The former has an area of 11,003 square miles, traversed by hills from 500 to 1,000 feet high, enclosing wooded valleys. The soil and climate are well adapted both for agriculture and pasture, and wool, wheat, cattle and other produce are exported. The chief rivers are the Wanganui, Rangitiki, Manawatu and Otaki. The country was first settled in 1840. Pop., exclusive of Maoris (1906), 179,868. The city of WELLINGTON, on an inlet of Cook Strait, has accommodation for vessels of the largest size. In 1865 it superseded Auckland as the capital of New Zealand. The principal buildings are Government House, the Museum and the Anglican and Catholic cathedrals. Parliament House was burned down, all but the Library, on December 11th, 1907. The manufactures comprise leather, boots, soap, candles, flour, bricks and tiles, besides shipbuilding, meat-preserving and brewing. Pop. (1906), 58,563, or, with the suburbs, 63,807.

Wellington, ARTHUR WELLESLEY, DUKE OF, Field-Marshal and statesman, was born at Dangan Castle, Co. Meath, Ireland, on April 29th, 1769,



DUKE OF WELLINGTON.

(After the portrait by Sir Thomas Lawrence, P.R.A.)

being the third son of Garrett Wellesley (originally Wesley), afterwards the Earl of Mornington, an excellent musical composer. He was first sent to a private school in Chelsea, and thence to Eton, finishing his studies in France. In 1787 he entered the army as an ensign, and was promoted to the rank of lieutenant within a year. His first regiment was the 73rd, from which he exchanged successively into the 76th, 41st and 12th Light Dragoons, etc. In 1793 he became a lieutenant-colonel in the 33rd by purchase, and was on the high road to further

promotion. But politics claimed some of his attention for a few years. He was elected M.P. for Trim in the Irish House of Commons in 1790, but made no particular mark in that assembly of brilliant speakers. He was sent to the Low Countries in 1794, and saw some fighting, but was so disheartened by the British reverses there that he was about to leave the army; but other expeditions fortunately encouraged him, and he went to India (1796), where he distinguished himself greatly in the struggle with France, and took a prominent part in the storming of Seringapatam (1799). His brother Richard, Marquis of Wellesley, was at that time Governor-General, and it was through his influence, perhaps, that the future duke obtained a chief command in the Mahratta War. He gained such splendid victories over the enemy (of which the chief battle was that of Assaye on September 23rd, 1803) that he was made K.C.B. and Major-General, and in 1805 came back to England with considerable prestige. In 1806 he married the third daughter of the Earl of Longford, to whom he had been betrothed since his aide-de-camp days in Ireland, and in the same year was elected M.P. for Rye, being appointed Chief Secretary for Ireland in 1807. The great and final contest with Napoleon now began, and Wellington was destined to go through it with exceptional glory. In July, 1808, he left Ireland for Portugal, and later in the year inflicted several defeats on the French, notably at Vimiera. In 1809 he was made commander-in-chief of the Peninsular army, and in May of that year forced the French to leave Oporto, and repulsed them with great loss at Talavera (July 27, 28), a victory for which he was created Viscount Wellington. Successively securing Busaco, Almeida and Ciudad Rodrigo, after determined resistance, he finally captured Badajoz, and by this series of exploits practically destroyed the French occupation of Portugal. The French were again utterly routed in July, 1812, at Salamanca, and in June, 1813, at Vittoria, when he was gazetted Field-Marshal, having, in the previous year, been promoted first Earl and afterwards Marquis. He then drove the French out of Spain, defeating Soult at Toulouse (1814) just as Napoleon abdicated. He was then made Duke of Wellington and Marquis of Douro. On Napoleon's escape from Elba Wellington was given command of the British army, and defeated him at Waterloo, June 18th, 1815. This decisive triumph, for which he was presented by the nation with the estate of Strathfieldsaye in Hampshire, ended the Duke's active military and opened his political career. In 1827 he became titular Commander-in-Chief, and in 1828 Prime Minister. He granted Catholic Emancipation, but strongly opposed Parliamentary Reform, his attitude rendering him so unpopular that he was hooted on the anniversary of Waterloo and had to protect the windows of Apsley House in London with iron shutters. After the resignation of Sir Robert Peel's cabinet in 1835, he took little part in politics, but supported the abolition of the Corn Laws. Dying at Walmer Castle on September 14th, 1852, he was buried in St. Paul's Cathedral.

Wellingtonia. [SEQUOIA.]

Wells, a cathedral city, Somersetshire, England, 18 miles S.W. of Bath, at the foot of the Mendip Hills. It derives its name from the hot springs in its neighbourhood, and grew up early in the 8th century around the collegiate church. The noble Early English cathedral was founded a few years later, but not completed until 1239, the west front, in Gothic style, being enriched with many statues. The episcopal palace is an ancient castellated structure surrounded by a wall and moat. In 1088 the see was united with Bath. Other buildings are St. Cuthbert's Church, the Grammar School, Bluecoat School, Town Hall and Market House. The chief industries are paper-making and brush-making. Pop. (1901), 4,849.

Wells, Artesian. [ARTESIAN WELLS.]

Welwitschia mirabilis, one of the most remarkable of plants, discovered by the Portuguese botanist Welwitsch in the loose sand of Benguela, from 300 to 400 feet above the sea. It has since been found at Mossamedes and near Walvisch Bay, in South-West Africa, a rainless area; so that its latitudinal range is from 14° to 23° S. It belongs to the Gnetaceæ, a small order of Gymnospermia. It has a branched tap-root, two cotyledons, and an enormously-enlarged obconic, flat-topped, woody, epicotyledonary axis, which bears only two foliage-leaves and short marginal flowering-branches bearing cones. The stem forms a saddle-like mass not over a foot high, but sometimes 5 or 6 feet across; while the two persistent leaves grow into leathery thongs 6 feet in length, torn into strips by the wind, and trailing on the sand.

Wend, originally a general name of the Slav race, now restricted to a small group of the Polabish (Elbe) Slavs, still surviving in Upper and Lower Lusatia (Prussia and Saxony), where they are completely surrounded by populations of German speech. They still number about 130,000, but are being slowly Germanised.

Wenlock, or MUCH WENLOCK, a town of Shropshire, England, 12 miles S.E. of Shrewsbury. It formerly returned two members to Parliament and is said to have been the first borough that acquired that privilege by charter. The chief buildings are Holy Trinity Church, the Guildhall, Market Hall and Corn Exchange. Of the once magnificent Benedictine priory founded about the end of the 11th century by Roger de Montgomery few portions remain, but the Prior's House is in fine condition. Every Whit Tuesday Olympic Games are held. The trade of the town mainly depends upon the produce of the surrounding agricultural district, and the adjoining quarries yield a great quantity of lime and limestone. Pop. (1901), 15,866.

Werewolf (i.e., a manwolf), a sorcerer supposed to have the power of assuming the shape of a wolf, at the same time putting on wolf-like nature and habits, feeding on human flesh, and sometimes tearing up dead bodies from the grave and devouring them. This transformation was said to be effected by the sorcerer anointing himself with a magic salve, or putting on an enchanted girdle.

Wesley, CHARLES, hymn-writer, was born at Epworth, Lincolnshire, on December 18th, 1708, and was associated with his famous brother in the earlier years of Methodism. He received his education at Westminster and Christ Church, Oxford, and while he did not undertake any of the more arduous work in connection with the Methodist movement, he served the cause very greatly by his hymns, which were printed in the collection brought out by John Wesley and adopted by the sect, and are still very popular. Two of his sons were eminent organists—CHARLES WESLEY (1757–1815) at St. George's, Hanover Square, London, and SAMUEL WESLEY (1766–1837) at the Chapel Royal. The latter's son, SAMUEL SEBASTIAN WESLEY (1810–76), was organist of Gloucester Cathedral and distinguished as a composer of Church music.

Wesley, JOHN, founder of Methodism, was born at Epworth in Lincolnshire, of which his father was rector, on June 17th, 1703. He was first sent to the Charterhouse, and passed thence to Christ Church, Oxford, and in 1726 was elected Fellow of Lincoln College. After his ordination he was for a short period his father's curate, but, leaving this post, went to Oxford in 1729 to discharge the duties of his Fellowship, and there co-operated with his brother Charles in a society started by the latter for the study and dissemination of religious principles. This may be considered the beginning of Methodism. In 1735 the brothers went to Georgia, where they laboured with great zeal for fully two years. John Wesley allied himself to some extent with the Moravians, and kept up his connection with them for a couple of years after his return from America early in 1738; but in this latter year he felt himself irresistibly impelled to what is known as Methodism. He travelled about the English counties, preaching fervently, and was at first not very strongly opposed, but at last the Established Church began to see the perils of the active propagation of his doctrines, and he met with severe opposition. Then he formed his followers into a distinct sect, and in May, 1739, the earliest Methodist chapel was founded in Windmill Hill (afterwards Tabernacle Street, Finsbury Square), London, which remained the headquarters of the body till 1778, when the City Road Chapel was opened. It is computed that from this date to his death he travelled 250,000 miles, preaching more than 40,000 sermons. His followers increased very rapidly, and were soon numbered by tens of thousands. He died at the Chapel House in City Road, London, on March 2nd, 1791.

West, BENJAMIN, painter, was born at Springfield, Pennsylvania, on October 10th, 1738. His bent towards art showed itself early and as a young man he practised portraiture in Philadelphia for two years. In 1760 he arrived in Rome where he studied assiduously, while supporting himself by his profession, in which he acquired a reputation that stood him in good stead when he settled in London in 1763. The patronage of George III. secured his success, and he was one of the founders and original members of the Royal Academy (1768). In 1792 he succeeded Sir Joshua Reynolds

as President, declining the knighthood, but hinting that he would accept a baronetcy. He died in London on March 11th, 1820. Most of his pictures were painted on a colossal scale, the best being "The Death of Wolfe," "William Penn's Treaty with the Indians" and "Christ Healing the Sick in the Temple." The great vogue he enjoyed in his own day did not last. His works are tame and uninteresting and their colour is poor. But he had a good sense of composition and was the first to break away, in the "Death of Wolfe," from the absurd convention of dressing modern figures in Greek and Roman costume.

West Australia, formerly Swan River Settlement, is the largest state of the Australian Commonwealth, embracing an area of 975,920 square miles, and including all that part of the continent which lies W. of 129° E. The coastline of 3,000 miles is mostly flat, indented by many bays, and protected to some extent by coral reefs, but safe harbours are rare. The surface is undulating, being broken by the Darling, Blackwood and Victoria Ranges, which seldom exceed 2,000 feet in height. The only important river is the Swan, but other streams are the Murchison, Gascoyne, Ashburton, Fortescue, De Grey, Fitzroy and Ord. The chief crops are wheat, oats, barley and hay, and potatoes, grapes and maize are cultivated. The forests yield splendid timber, especially jarrah, Karri, eucalyptus and sandalwood. The flocks of sheep and herds of cattle are heavy, and horses, pigs and goats are raised in great numbers, and camels are also reared. Gold, silver, copper, tin and coal are the leading minerals. Gold was discovered in 1886 and the principal fields are Coolgardie, Dundas, Kimberley, Pilbarra, Murchison, Ashburton and Peak Hill. The first settlements were made at Perth, Fremantle and Guildford in 1829, and convicts were sent out from 1848 to 1868, voluntary emigration progressing but slowly. In 1890 the state received a constitution and became self-governing, and in 1900 joined the Commonwealth, which was proclaimed on January 1st, 1901. Perth (52,300), on the Swan River, is the capital, and Fremantle has a pop. of 27,100. Pop. of state (1901), 184,124.

West Bromwich, a town of Staffordshire, England, 6 miles N.W. of Birmingham. The principal buildings are All Saints' Church, the District Hospital, Town Hall, Free Library, Science and Art Institute and Oak House Museum and Art Gallery. Situated in a rich coal and iron district it has blast furnaces and iron works and manufactures machinery, agricultural implements, fire-arms and tools. Coal-mining, brick-making, malting and lime-burning are also carried on. Pop. (1901), 65,175.

West Indies, the name given by early geographers to the group of islands scattered between the continents of North and South America, the impression being that they formed part of Asia. The archipelago extends from 10° to 27° N. and from 59° 30' to 85° W. and comprises the Bahamas, Barbados, Jamaica with Turks Islands, Leeward

Islands, Trinidad with Tobago and Windward Islands. They are chiefly volcanic, and present a bold and rugged outline, rising to the height of 8,000 feet, the valleys producing sugar, coffee, cocoa, cotton, indigo, tobacco, spices, drugs, fruits and every kind of tropical vegetation, whilst the mountains are covered with a great variety of valuable timber. The climate, though tropical, is not excessively hot. Fevers, however, prevail on the coasts, and hurricanes cause serious losses, whilst Kingston and other parts of Jamaica were destroyed by earthquake on January 14th, 1907. Early in the 17th century Great Britain, France and other European Powers began to form settlements, and during the subsequent wars up to 1815 the islands frequently changed hands. The term is now commonly restricted to the British possessions, exhibited in the following table, Cuba and Haiti being regarded as independent, while Porto Rico belongs to the United States. The Danish West Indies (St. Croix, St. Thomas and St. John) are insignificant, having an area of only 138 square miles and a population of 30,527, and Martinique, Guadeloupe and a few others are French.

BRITISH WEST INDIES.	AREA IN SQUARE MILES.	POPULATION (1901)
Bahamas	5,450	53,735
Barbados	166	182,306
Jamaica	4,200	639,491
Turks Islands	224	5,287
Leeward	701	127,536
Trinidad	1,754	255,148
Tobago	114	18,750
Windward—		
Grenada	138	60,420
St. Vincent	132	47,548
St. Lucia	233	53,880
TOTAL	18,107	1,452,720

Westmeath, an inland county of Ireland in the province of Leinster, bounded on the N. by Cavan, on the N.E. and E. by Meath, on the S. by King's County, on the W. by Roscommon, and on the N.W. by Longford. It occupies an area of 708 square miles. The surface largely consists of hill, dale, lake and river. Knocklayde (795 feet) is the highest point; the Inny, Glone, Deel and Brosna are the chief streams, but the Shannon, of which Lough Ree is an expansion, is a natural boundary on the west; the other lakes are Sheelin, Kinale, Dereveragh, Lene, Glone, Bawn, Iron, Owl and Ennell. Oats, turnips and potatoes are the principal crops, and the live-stock includes sheep, cattle, horses, pigs, goats and poultry (turkeys and geese especially). Copper, lead, coal and marble occur, but not to a remunerative extent. Textiles are the leading manufacture. The capital is Mullingar (4,500). Pop. (1901), 61,629.

Westminster, a city of Middlesex, England, comprising a large portion of the west end of London. Known in earlier times as Thorney Island, it grew up around the Saxon palace and the minster of St. Peter (now the Abbey) in the 7th century and is described in Domesday as a

village. The liberties extended from the Thames to Tyburn and from the Horseferry Road to the Fleet Ditch, and in 1541, being made the seat of a bishopric, it was raised to the rank of a city. Parliaments were held here in the 13th century, and the courts of justice followed the regal Court and ultimately became established within its precincts. The Abbey was founded on the old site by Edward the Confessor (1049-65), rebuilt by Henry III. (1245-72), and enlarged and beautified by various monarchs and by successive abbots. Westminster Hall, first built by William Rufus, but roofed and remodelled by Richard II., has been recased with modern stonework and, until the erection of the Palace of Justice in the Strand, accommodated the Law Courts. The Houses of Parliament, built from designs by Sir Charles Barry, succeeded the former Houses, which were burned down in 1834. Other familiar buildings in Westminster, besides the Chapter House and Jerusalem Chamber, are the School; all the Government Offices; St. James's and Buckingham Palaces; the National Gallery, National Portrait Gallery and Tate Gallery; St. George's, Hanover Square, St. Anne's, Soho, St. James's, Piccadilly, St. George's-in-the-Fields, St. Giles's, St. Clement's Danes, St. Mary in the Strand, the Chapels Royal, the Catholic Cathedral (1903) and many more churches; the Church House; the National Liberal, Constitutional, Reform, Carlton and other clubs; New Scotland Yard; and the School Board offices. Here also are the Thames Embankments, Hyde Park, Green Park and St. James's Park. Pop. (1901), 183,011.

Westmorland, a county of Northern England, lying an area of 789 square miles, bounded on the N.W. and N. by Cumberland, on the N.E. by Lancashire, on the E. by Yorkshire, on the S. and S.W. by Lancashire and Morecambe Bay. Most of the surface is broken by the Pennine and Cheviot ranges (Helvellyn 3,118 feet, Fairfield 2,500 feet) and by bleak moorlands; but the valleys, especially in the south-west, are fertile, and contain rich pastures, whilst the forests yield valuable timber. Oats, turnips and potatoes are the leading crops. Sheep, cattle, horses and pigs are raised. The lakes of Grasmere, Windermere, Ullswater and Ullswater are noted for natural beauty. The Kent, the Eden and the Lune are the chief rivers. Lead is the principal mineral, but iron, copper and zinc occur. Fine building stone, granites and Shap granite are extensively quarried. Woollen cloth and snuff are manufactured at Kendal, and paper-making and brewing are also carried on. Appleby (1764) is the capital. Pop. (1901), 64,409.

Weston-super-Mare, a watering-place of Somersetshire, England, on the Bristol Channel, 20 miles S.W. of Bristol. It is wholly of modern growth, its bracing dry air, equable climate and fine surroundings having brought it into great vogue as a health and holiday resort. It has an esplanade, pier and all the customary features of a desirable seaside town. The principal buildings are the church of St. John the Baptist, the Town Hall, Free Library and Museum, and the Royal West of England Sanatorium. Pop. (1901), 19,047.

Westphalia (German, WESTFALEN), a province of Prussia, Germany, bounded on the N. by Hanover, on the E. by Hanover, Lippe-Detmold, Schaumburg-Lippe, Brunswick, Hesse and Waldeck, on the S.W. by Rhenish Prussia, and on the N.W. by Holland. It has an area of 7,804 square miles. The surface is mainly hilly, but is nowhere more than 3,000 feet above the sea. The Lippe, Ruhr, Lenne, Weser and Ems are the chief streams. The principal crops are rye, oats, wheat, potatoes, flax. Cattle and swine form the leading live-stock, Westphalian hams being famous. The mineral resources are extremely valuable and include coal, iron, copper and zinc. The manufactures embrace linens and other textiles, cast and wrought iron, machinery, tools, rails, glass, paper and hardware. Münster (81,468) is the capital. Pop. (1905), 3,618,090.

West Point, on the right bank of the Hudson, New York State, United States, 50 miles N. of New York, is noted as the seat of the United States Military Academy, founded here in 1802. Owing to its natural strength, the site was selected for a fortress during the Revolutionary War. The fortifications were planned by the Polish patriot Kosciuszko. The ruins of Fort Putnam still crown a hill 600 feet above the river level. The college buildings comprise officers' quarters, cadets' barracks, class rooms, library, mess-rooms, riding hall, hospital and the Cullum Memorial Hall. About 500 students are usually in residence.

West Virginia, an east central State of the American Union, bounded on the N. and N.E. by Pennsylvania and Maryland, on the S.E. and S. by Virginia, and on the W. by Ohio and Kentucky. It covers an area of 24,780 square miles. The surface is largely mountainous, the Alleghenies traversing the state with a north-easterly to south-westerly trend. The highest point is Spruce Knob (4,860 feet). The principal rivers are the Big Sandy, Guyandotte and Great and Little Kanawha. The chief crops are maize, wheat, oats, rye, potatoes and hay, and most orchard fruits grow well. The mineral wealth consists of coal, petroleum and natural gas—all of first-rate importance,—besides salt, kaolin, copper, lead and zinc. Iron and steel, lumber products, glass, leather, bricks, tiles and pottery are the leading manufactures. The capital is Charleston (11,099), on the Great Kanawha. Formerly part of Virginia, the inhabitants took strong exception to the secession movement in 1861, framed a constitution for themselves in that year, and were admitted as a new state into the Union in 1863. Pop. (1900), 958,800.

Wexford, a county in the province of Leinster, Ireland, with an area of 301 square miles, bounded on the N. by Wicklow, on the E. and S. by St. George's Channel, and on the W. by Waterford, Kilkenny and Carlow. Mountainous in the north, where Mount Leinster attains a height of 2,600 feet, it is level and fertile towards the coast, several lagoons dotting the surface. The Barrow, Slaney and Bann are the chief rivers. Wheat, oats, barley, rye, potatoes and turnips are the principal crops. Live-stock are raised in great numbers, poultry being

a speciality. The fisheries form the leading industry apart from agriculture. Wexford (11,168), the capital, has a commodious harbour and is in daily communication by Rosslare by steamer with Fishguard in Pembrokehire. Wexford was the main seat of the rising of 1798, there being encounters with the rebels at Vinegar Hill, Enniscorthy, New Ross and Newtownbarr. Pop. (1901), 104,104.

Weymouth and Melcombe Regis (usually, WEYMOUTH), a watering-place of Dorsetshire, England, at the mouth of the Wey, 8 miles S. of Dorchester. Weymouth was on the right, Melcombe Regis on the left bank of the river, being connected by means of a bridge. They were constituted one borough in 1571. Having won the favour of George III., the town soon became a popular sea-bathing resort, and is one of the ports of communication with the Channel Islands. Ship-building and the making of ropes and sails, besides the fisheries, are the chief industries. Pop. (1901), 19,843.

Whale, an animal belonging to the order Cetacea, of which there are two living groups or sub-orders, the differences between which are strongly marked. They are known as (1) Mysticetacea, or Baleenoids, from the baleen or whalebone with which the mouth is furnished, and (2) Odontoceti, Delphinoids, or Toothed Whales. The whalebone grows in flattened horny plates along each side of the palate, and its function is that of a strainer or sieve. The Whalebone Whales feed on minute crustacea and small molluscs. The mouth is filled with water, and when the jaws are closed and the tongue is raised the water streams out through the whalebone, leaving behind the small marine animals. These are swept off the whalebone with the tongue and swallowed, and the mouth opened for another catch. The genus *Balaena* contains the Right Whales, so called from their yielding the greatest quantity of blubber and the best baleen. The skin of the throat is smooth, there is no dorsal fin, the short broad pectoral limb has five digits, the head is very large and the baleen long and narrow, black in colour, and highly elastic. The Greenland or Arctic Right Whale (*B. mysticetus*) is found in the seas on both sides of Greenland. The length of an adult male is from forty-five feet to fifty feet. The Southern Right Whale (*B. australis*) has the head smaller in proportion to the body and its whalebone is shorter. Its home is in the South Atlantic, and there are varieties or local races. The Humpback Whale (*Megaptera* bops), the single species of the genus, is about the same size as the Greenland Whale, and the female is larger than the male. The dorsal fin is small and far back, and the skin of the throat is wrinkled into folds. *Neobalaena marginata*, from Australian seas, is the smallest whalebone whale. *Rhachianectes glaucus*, the Grey Whale, is from the South Pacific. [HORQUAL.] The Toothed Whales have many more representatives than the Baleen Whales, the most important being the Sperm Whale. Allied to the Bottlehead, and with a pointed rostrum, are the whales of the genus *Mesoplodon*, chiefly from the Southern hemisphere, and the single species of

Berardius, from the seas round New Zealand. The former have a single tooth on each side in the lower jaw; the latter has two. Of the River Dolphin there are three genera, each with a single species. In all the jaws are produced into a snout, an bear above and below a great number of teeth set close together. *Platanista gangetica*, from India rivers, is about eight feet long; *Inia geoffroyensis* from the Upper Amazon and its tributaries, seven feet long; and *Pontoporia blainvilliei*, from the mouth of the Rio de la Plata, about five feet long [For the true Dolphins, see BELUGA, CAALIN WHALE, DOLPHIN, GRAMPUS, NARWHAL and PORPOISE.]

Wheat, the most widely-diffused and most important of cereal grasses. An annual, producing "tilers," or secondary shoots, from its base. Its leaves have a small ligule, and its inflorescence is a compound spike with a sinuous rachis and compressed spikelets. Below each spikelet are two "chaff scales," or outer glumes, and each spikelet contains from two to eight flowers, the upper ones sterile. The flower has a "flowering glume," which may have an awn, when the wheat is termed "bearded" a delicate two-ribbed "pale"; two minute, pointed membranous "lodicules"; three stamens; and a downy ovary, with two feathery stigmas. The grain is oblong or ovoid, with a furrow down on side, its seed so completely filling it that the coats are only separated in milling. The outer coat of the endosperm contains the nitrogenous gluten, the inner ones being filled with starch-grains. The embryo or "chit" lies obliquely across the lower end of the albumen. Haeckel recognises the species: *Triticum monococcum*, wild in Mesopotamia and Greece, found at Troy and in Swiss lake dwellings, and now cultivated in Spain; *T. sativum* including three races, the spelt (*T. spelta*), *T. dicoccum* and *T. tenax*; and Polish wheat, *T. polonicum* rarely cultivated in England. Both spelt and *T. dicoccum* were grown in prehistoric times, and are still cultivated in Southern Europe. DeCandolle infers wheat to have had its origin in Mesopotamia, and many of the best authorities refer all the many cultivated varieties to a single wild ancestral form. *T. tenax*, the true wheat, include compactum, the soft wheats, *turgidum*, the turgid wheats, and *durum*, the hard wheats. Hard wheats are chiefly grown in hot, dry countries, turgid wheats, such as the many-spiked Egyptian or "mummy" wheat, in plains; spelts in poor mountainous soils. Cold climates produce thin flexible, hollow straw, long ears and soft flour grain; moist climates, broad leaves; hot climates more solid and more rigid straw, shorter ears and more horny grain; and dry climates, narrow leaves and bearded and downy glumes. The finest wheat are found in fertile alluvial valleys and plains. The soft wheats contain relatively more starch; the hard ones more gluten, the latter making the better flour. Hard wheat is used in the manufacture of macaroni. Bearded wheat is mainly advantageous as being protected from birds. Wheat requires minimum temperature of 41° F. to germinate, 42° to grow, 55° to flower, and more to ripen grain; but

it is a remarkably accommodating species as to the time during which it obtains its full supply of heat. It is grown from the Strait of Magellan to lat. 65° in Norway.

Wheatear, from the Anglo-Saxon *hwit-ears* = white-rump (*Saxicola ænanthe*), a well-known chat, visiting Great Britain in spring and leaving in autumn. Its length is about six inches; the plumage on the upper surface is silver-grey, with a patch of white on the rump; there is some black on the wings, and the white tail-feathers are tipped with black.

Wheat Midge, a small fly known as *Diplosis tritici* (Kir.), a member of the family Cecidomyiidae and the order Diptera. The fly lays its eggs in the flower of the wheat; the maggots hatched from the eggs devour the pollen grains, and thus prevent the fertilisation of the flowers and formation of the grain.

Wheatstone's Bridge, in electricity, is an arrangement of conductors by which an unknown resistance may be balanced against others of known value, the object being to measure the former in terms of the latter. It was named after SIR CHARLES WHEATSTONE (born at Gloucester in 1802; knighted in 1868; died at Paris on October 19th, 1875), the inventor, who, though not the creator of the electric telegraph—no one can lay claim to that—was, along with Sir W. F. Clarke, the first to render it available for public transmission of messages.

Wheel and Axle consist of two cylinders turning round a common axis; the larger cylinder is termed the wheel and the smaller one the axle. The force, *P*, is applied at the end of a rope which is coiled round the wheel, while the weight, *w*, or other force to be overcome, acts at the end of a rope coiled round the axle. Since the force acts through a distance equal to the circumference of the wheel, while the weight is raised through a height equal to the circumference of the axle, and since the work done by each is the same, it follows that the ratio between *P* and *w* is equal to that between the circumferences of axle and wheel, or $\frac{P}{w} = \frac{\text{radius of axle}}{\text{radius of wheel}}$. This form is chiefly used to illustrate the principles of mechanics; in practice the wheel is replaced by a crank or lever or toothed gearing, which makes the machine respectively a windlass, a capstan, or a "crab."

Wheel Animalculæ, the popular name for members of the class Rotifera.

Whelk, the common name for the members of the genus *Buccinum*, a genus of univalve mollusca or Gasteropoda. They are common on the English shores, ranging down, as a rule, to a depth of about 600 feet from the tide-line. The whelk is used as food and as bait. Its eggs are enclosed in small membranous sacs known as "nidamental capsules." These are aggregated into clusters, which are familiar objects on the seashore.

Whipping, a punishment inflicted for several of the smaller offences. By a statute of the reign

of Victoria striking or firing at the sovereign is punishable with whipping three or four times, and by a statute of the reign of George IV. an incorrigible rogue may be whipped. The punishment of whipping was inflicted formerly on persons of inferior condition guilty of petty larceny and other smaller offences; but in earlier times, by the usage of the Star Chamber, it was never inflicted on a gentleman. The Criminal Law Consolidation Acts, 1861, provide for the punishment of whipping to be inflicted upon males below sixteen years of age who have been convicted of various offences.

Whip-Poor-Will (*Caprimulgus vociferus*), an American goatsucker, about ten inches long, and very much like the European species in plumage. The popular name is derived from its cry. It is found in the eastern States of the Union; in the western States it is replaced by a smaller species (*C. nuttalli*), with a similar though feebler cry; and southwards by the larger Chuck-Will's-Widow (*C. carolinensis*).

Whirligig Beetles, a family of Coleoptera known as the Gyrinidae. They are aquatic beetles, and live skimming over the surface of pools, following a circular or irregular darting course. They are small, and are, as a rule, bluish-black in colour. The best-known English species is *Gyrinus natator* (Linn.).

Whirlpools are circular currents caused upon the surface of water when opposing currents meet or when the wind blows upon the water in a particular way. The eddies made when two swift rivers join, or when a stream encounters an obstacle on its way, round which it has to flow, are examples of small whirlpools.

Whirlwind. [TORNADO.]

Whist, a well-known scientific game of cards, is of some antiquity, though its form has considerably changed. It was formerly known by the names of "ruff," "trump," "ruff and honours," etc., and in some forms the whole pack was not employed. In 1743 appeared Hoyle's treatise, which was for some time the great authority. The game then played was known as "long whist," consisting of ten points. In the latter half of the 19th century the old game was found too long, and was cut in half (the 'honours' being dropped) and called "short whist," the other game being now well-nigh obsolete.

Whistler, JAMES ABBOTT MCNEILL, artist, was born at Lowell, Massachusetts, in 1834. He entered the United States Military Academy at West Point, but disrelishing martinet discipline retired and took to art, for which he had already evinced a marked predilection. He studied in Paris under Charles Gabriel Gleyre, and first attracted notice by a number of masterly etchings. He came to London in 1859 and found in the Thames above and below bridges many picturesque subjects for the needle, which he rendered with delightful sympathy and in perfect style. Paris, London and Venice were alike inspiring to him, and the three series known by these names will live for ever. In oil painting,

too, he had manifested genius of the highest order, as was amply proved by his "La Princesse du Pays de la Porcelaine" (1864), "My Mother" (1872, now in the Luxembourg), "Thomas Carlyle" (1873, in the Glasgow Art Gallery), and "Miss Alexander" (1874). A trip to Valparaiso in 1865-6 yielded the beautiful "Nocturne, Valparaiso Harbour." In 1877 John Ruskin, in *Fors Clavigera*, had written concerning Whistler's nocturnes, mostly studies of

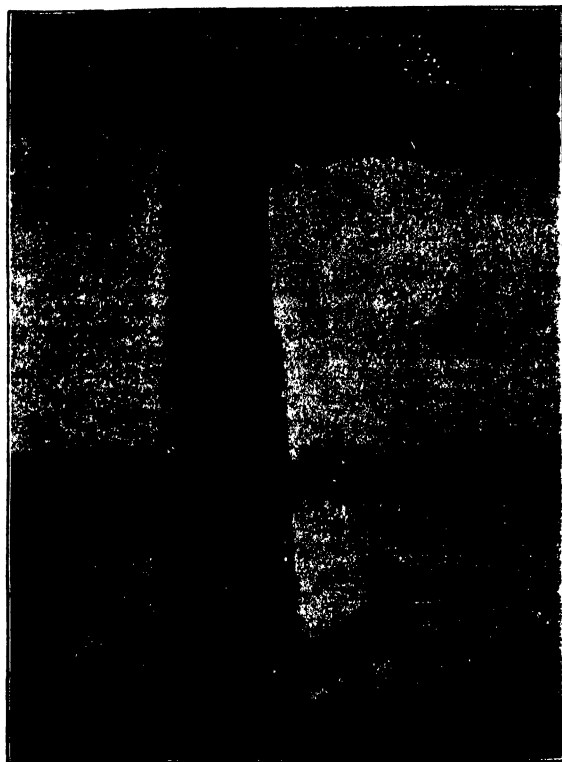
for the mansion of Mr. and Mrs. F. R. Leyland of London, which ultimately was acquired complete for New York in 1904. He was a clever writer, as he showed in his *Gentle Art of Making Enemies* (1890). He died in London on July 17th, 1903.

Whitby, a seaport and watering-place, Yorkshire, England, at the mouth of the Esk, 19 miles N.W. of Scarborough. Its bracing climate has made it popular as a holiday resort, and its many picturesque features have rendered it a favourite hunting-ground with artists. On the cliffs stand the ruins of the famous abbey, founded in 657 by St. Hilda, where Caedmon, the first great English poet, resided. The industries include shipbuilding, roperies, sailcloth factories and fisheries. The manufacture of jet ornaments, though a speciality, is on the decline. Pop. (1901), 11,748.

White, GILBERT, naturalist, was born at Selborne, Hampshire, on July 18th, 1720, and educated at Basingstoke and Oriel College, Oxford. He took holy orders, and was so attached to his birth-place that nearly all his curacies were in the vicinity of it. He spent most of his life in the study of plants, animals and various phases of nature, and summed up his observations in his classic book, *The Natural History of Selborne* (1789). He was curate of Selborne from 1784 till his death there on June 26th, 1793.

White Ants are members of the family Termitidæ and the order Neuraptera, and, properly, are not ants at all. They live in colonies containing an enormous number of individuals, which are divided into distinct castes—namely, kings, queens, workers and soldiers. The two first are sexually mature; the two last are larvae of either sex, in which, however, the reproductive organs are either rudimentary or not developed. The king and queen Termites are larger than the other individuals and are wingless. The queen, when full of eggs, is sometimes 3 inches long, and weighs as much as 20,000 neutrons. The eggs hatch into larvae, which are like the adults and do not

pass through a metamorphosis. Some develop into workers; others are provided with a pair of powerful mandibles, and act as soldiers for the defence of the colony. In the early part of the rainy season generations of winged males and females are developed; these are guided out of the colony by the workers, and take their "marriage flight." They soon lose their wings, which may be seen to strew the ground for acres around the colonies. The insects then pair, and each pair founds a fresh family. The Termites live in large hives or mounds known as "termitaria." These are often of remarkable forms, and as much as 15 feet in height; they are composed of earth worked into a compact mass and made extremely hard and tough. This is



OLD BATTERSEA BRIDGE.

(From the painting by James A. McNeill Whistler.)

colour by twilight and at night, "I never expected to hear a coxcomb ask two hundred guineas for flinging a pot of paint in the face of the public." This was not criticism and Whistler might well have ignored it, but the allusion to the "coxcomb" touched him up and the colossal contempt goaded him. He sued Ruskin for libel and was awarded one farthing damages. Then people sided with Ruskin; now they would allow that Whistler was entitled to select his subjects and competent above most if not all of his contemporaries to carry them out. In 1878 he turned to lithography and in this branch also achieved wonderful results. In decoration there has never been anything finer than the so-called Peacock room he accomplished

traversed by galleries, and contains the chambers in which the insects live. The White Ants are extremely destructive to wood, paper, textile goods, leather, etc. The Termites are mainly tropical in distribution, but some occur in the United States, and some have managed to establish themselves in southern France.

Whitebait, the name given to the fry of the herring, often mixed with that of the sprat, when taken for the table. These small fish were formerly considered to form a separate species, and by some naturalists a distinct genus of the Herring family. Closer investigation, however, has led to their identification, and in a mass of "whitebait" the fry of the sprat can be distinguished from that of the herring. The small fish, fried in lard, are esteemed as a delicacy.

Whitefield, or **WHITFIELD**, **GEORGE**, evangelist and leader of Calvinistic Methodists, was born at Gloucester, England, on December 16th, 1714, and educated in his native city and at Pembroke College, Oxford, where he gradually found himself in strong sympathy with the new sect of Methodists and where he was converted in 1735. In 1736 he was ordained and almost at once attained a widespread reputation as a preacher. His natural eloquence was increased by his intense enthusiasm and his undoubted histrionic ability and power of managing his voice. At the suggestion of the Wesleys he went to Georgia towards the close of 1737, but did not remain there long. On his return he carried out various preaching tours, and the Methodists were joined into one large sect, ever increasing in numbers. A rift occurred with John Wesley in 1741 on a doctrinal subject, and each took his own way. Whitefield visited Scotland and Wales, and also paid other visits to the United States where, at Newburyport, Massachusetts, he died on September 30th, 1770.

Whitehaven, a seaport of Cumberland, England, on the southern shore of the mouth of the Solway Firth, 36 miles S.W. of Carlisle. The chief buildings are the Town Hall, Court House, Free Library, Custom House and Infirmary. The industries include shipbuilding, iron- and brass-founding, engineering, textiles, the making of soap, bricks and earthenware and dyeing. Pop. (1901), 19,325.

White Lead. The common pigment known by this name consists chemically of a mixture of basic carbonates of lead. In composition it is variable, usually corresponding more or less to the formula $2\text{PbCO}_3 \cdot \text{Pb}(\text{OH})_2$. It is largely prepared by subjecting lead sheets or thin bars to the fumes of acetic acid and decaying tan (Dutch process), or more expeditiously by passing a current of carbonic acid through a solution of lead acetate containing the hydrate or litharge suspended in it. As a pigment white lead has most of the qualities required, but lacks permanence, turning black if exposed to vapours containing sulphuretted hydrogen.

Whiteley, **WILLIAM**, the Universal Provider, was born at Agbrigg, near Wakefield, Yorkshire, on September 27th, 1831. His father, a corn dealer, apprenticed him to a draper in Wakefield. Before

his time was up, however, he went to London in 1851, the year of the first Great Exhibition, and for a short period served as assistant to a draper in Ludgate Hill. Desirous of starting business on his own account, he leased a shop, 31, Westbourne Grove, then an undeveloped quarter of the West End, the possibilities of which had impressed him. Here he prospered, and adding shop to shop as business grew—he was never ambitious to carry on his multifarious concerns under one roof—his premises at last covered 14 acres and his trading yielded him a net income of £100,000 a year. From the circumstance that he undertook to supply whatever his customers might wish for—no matter what it might be: a lion, a life policy, or a *confession de Paris*—he became known as the Universal Provider, a cognomen which he accepted with pride. He was assassinated in his office on January 24th, 1907. By his will he left £1,000,000 to found the Whiteley Homes for the Aged Poor. He never advertised, and he owed his success to his mania for work, his indomitable energy in carrying through whatever he put his mind to, and his purveying of articles of good quality at moderate prices. He was the first to run single-handed a concern of the nature and scope of a stores.

White Sea, an arm of the Arctic Ocean, in the north of Russia-in-Europe. It contains three bays—Kandala in the north-west, where it is 700 feet deep, and Onega and Dvina in the south. It is fed by the Mezen, Dvina, Onega, Vygá and other rivers. It is usually icebound from the beginning of October till the end of May. Herring and cod are the chief fisheries. Archangel is the principal port on its shore.

Whiting (*Gadus merlangus*), a fish of the Cod family, common on the coasts of Northern Europe, and occurring plentifully off the British shores. The colour of the back is brownish-yellow, becoming paler on the sides, and silvery-white on the under parts. The usual size is from twelve to fifteen inches, but much larger specimens have been taken. Whiting are very voracious, and feed on smaller fish, worms and molluscs. The flesh is extremely delicate, but soon loses its freshness, whence large quantities of this fish are dried and salted chiefly for export. [BIB; COD.]

Whitlow, a form of inflammation met with in the thumb, one of the fingers, or more rarely one of the toes; it may affect the tissues under a nail or those within or surrounding the sheath of a tendon, or those of the periosteum of one of the phalanges. In the treatment of whitlow, particularly if the deeper structures are involved, an early incision is made, with a view to allowing the escape of matter.

Whitman, **WALT**, poet, was born in West Hills, Long Island, United States, on May 31st, 1819. He was educated at Brooklyn and New York, and was by trade a compositor and (in the War of Secession) a hospital attendant. In 1855 a great sensation was caused by his *Leaves of Grass*. His *Drum Taps* appeared in 1865, his *Two Trictrulets* in 1873, and an English edition of his *Poems* in

1868. He died at Camden, New Jersey, on March 27th, 1892.

Whitstable, a popular watering-place of Kent, England, on the southern side of the estuary of the Thames, 6 miles N.N.W. of Canterbury, of which it is the port. It is famous for its oysters, the "natives" noted for their delicate flavour. Pop. (1901), 7,086.

Whittier, JOHN GREENLEAF, poet, was of a Quaker family, and was born at Haverhill, Massachusetts, on December 17th, 1807. At first he worked on his father's farm, giving a portion of his time to shoemaking. In 1836 he published *Magg Megone*, an Indian legend in verse, and this was followed by many volumes of poetry, such as *Ballads* (1838), *Lays of my Home* (1843), *Voices of Freedom* (1849), *Songs of Labor* (1850), *The Panorama* (1856), *Home Ballads* (1860), *In War Time* (1863), *National Lyrics* (1865), *Snow-Bound* (1866), *The Vision of Eckard* (1878), and *At Sundown* (1890). He died at Amesbury, Massachusetts, on September 7th, 1892.

Whittington, SIR RICHARD (1350?-1423), Lord Mayor of London, was probably a native of Pauntley, in Gloucestershire, where his father owned property. On the latter's death in 1370 Whittington came to London, and prospered so well in business that he became thrice Lord Mayor (1397-8, 1406-7, and 1419-20), and lent large sums to Henry IV. and Henry V., although his knighthood is legendary. He is believed to have died in London in March, 1423. A very romantic and popular legend has grown up around his name, and "Dick Whittington and his Cat" has amused many generations of English children.

Whitworth, SIR JOSEPH, mechanic, was born at Stockport, England, on December 21st, 1803, and was educated by his father (a school-master) and at Ilke. In 1825 he entered the workshop first of Maudslay and Co., then of Holtzappel and finally of Joseph Clement (all in London), before setting up for himself in Manchester as a tool-maker in 1833. His greatest triumphs of this period were his discovery of a true plane surface, his measuring machine, by means of which a system of standard measures and gauges was rendered practicable, and his uniform system of screwthreads. At the International Exhibition of 1851 his exhibits were universally admired, and he was recognised as the greatest mechanical constructor of his day. In 1857 he was elected F.R.S. In this year he invented his rifle which officialdom ultimately rejected, although it anticipated all the features of future improvements. A like fate awaited his rifled gun, invented in 1862 and refused by the Ordnance Board in 1865. In 1870 he produced Whitworth steel for use specially in the making of big guns. In 1867 he took one of the five Grands Prix allotted to Great Britain at the Paris Exposition. In 1868 he received the Legion of Honour and next year was created a baronet. He died at Monte Carlo on January 22nd, 1887. He founded in 1868 thirty scholarships of the annual value of £100 each for proficiency in the theory and practice of mechanics.

Whooping Cough (PERTUSSIS), an infectious malady characterised by respiratory catarrh, with accompanying attacks of cough, which in most instances terminate in a peculiar crowing inspiration or "whoop." The disease is usually met with in children. It is more fatal in spring and autumn than at other times of the year, and it is highly contagious; it usually runs a prolonged course, and its period of incubation is said to be about a fortnight. Three stages of the disease are described, the catarrhal stage, the convulsive stage (in which the paroxysms of cough assume prominence), and the stage of decline. Uncomplicated whooping cough is rarely fatal, but vomiting, bronchitis, pulmonary collapse, pneumonia, and convulsions are apt to occur in association with the disease. Treatment consists in keeping the patient indoors, in administering light diet and tonic remedies, and counter-irritation is sometimes applied. When the spasms of cough are severe, antispasmodic remedies are usually given, and any complications require special treatment.

Wick, a seaport and county town of Caithness, Scotland, 18½ miles S. of John o' Groat's House. The chief structures are the Town Hall, County Buildings, Academy, Chamber of Commerce and Fish Exchange. The industries include rope- and sail-making, brewing and distilling, but the herring fisheries are of predominant importance, being amongst the most valuable of the north of Scotland. Pop. (1901), 7,911.

Wicklow, a county in the province of Leinster, Ireland, bounded on the E. by St. George's Channel, on the S. by Wexford, on the W. by Carlow and Kildare and on the N. by Dublin, with an area of 781 square miles. The coast is steep, and has only the harbours of Wicklow and Arklow. All the central portion is mountainous, the highest points reaching 3,000 feet. The scenery of the glens and vales is noted, Ovoca being the theme of Tom Moore's "Meeting of the Waters." The Liffey, Slaney, Ovoca and Vartry are the chief streams. Gold, silver, lead and copper occur. The principal crops are oats, potatoes, turnips and clover, and live-stock, especially sheep, cattle and poultry, are raised. Cordite and other explosives are manufactured, and the fisheries are of some consequence. Wicklow (3,228) is the capital. Pop. (1901), 60,824.

Widgeon, **Wigeon**, a duck belonging to the genus *Mareca*, which has numerous species widely distributed, distinguished by the bill being shorter than the head, small feet, long and pointed wings, and the wedge-shaped tail. The Common Widgeon (*M. penelope*) is a British winter visitor, and a few remain to breed in the north of Scotland.

Widnes, a town of Lancashire, England, on the right bank of the Mersey, 13 miles S.E. of Liverpool. The manufactures include soap, alkali, soda and chemicals (of which it is one of the chief seats), besides grease-works, iron-foundries, copper-works, rolling mills, locomotive factories and textiles. Pop. (1901), 28,580.

Wiesbaden, a watering-place of Hesse-Nassau, Prussia, 5 miles N. by W. of Mainz, 3 miles from

the right bank of the Rhine. It is greatly visited for its hot springs. The water of the Kochbrunnen, the chief spring, is of value in gout, dyspepsia and obesity, while others are efficacious in rheumatism, scrofula and nervous complaints. From 1771 public gambling was notorious in Wiesbaden till it was suppressed in 1873. The principal buildings are the Palace, Kursaal, Museum and Town Hall, in addition to numerous churches and educational and charitable institutions. Pop. (1905), 100,953.

Wigan, a town of Lancashire, England, on the Douglas, 18 miles N.W. of Manchester. There are extensive cotton factories, brass and iron works, chemical works and breweries, in addition to coal mines. The town is ancient, the first charter dating from Henry III., and in the Civil War strongly supported the Royalist cause. Pop. (1901), 60,764.

Wight, **ISLE OF** (Roman, *Vectis*), forms part of Hampshire, England, being separated from the mainland by the Solent and Spithead. It is triangular in shape, with a length of 23 miles by a breadth of 14 miles, and an area of 147 square miles. A range of hills runs through the centre, presenting a steep face to the south, fringed by the Undercliff, and sloping down to the sea with gentle undulations towards the north. St. Catherine's Hill is 830 feet high. The scenery is diversified and charming, the climate mild, and the soil fertile, especially to the east. Many sheep are pastured on the downs. The Medina is the chief stream. Newport (10,911), the capital, is in the centre; Cowes, in close proximity to Osborne House, faces Portsmouth, and is a famous yachting station. Near Newport are the ruins of Carisbrooke Castle, where Charles I. was imprisoned in 1647. Alfred Tennyson resided at Farringford, near Freshwater, for many years. Ventnor, Shanklin, Sandown, Bembridge and Ryde are favourite holiday resorts. The Needles are conspicuous objects to all up- and down-Channel voyagers, and Alum Bay is noted for its variegated sands. Some shipping is carried on at Yarmouth, and at Parkhurst, near Newport, is a great convict prison. Pop. (1901), 82,387.

Wigtownshire, the most south-westerly county of Scotland, bounded on the N. by the Irish Channel and Ayrshire, on the E. by Kirkcudbright and Wigtown Bay, on the S. by the Irish Sea, and on the W. by the Irish Channel. It occupies an area of 487 square miles. The coast is greatly indented and dangerous, but Loch Ryan is a capacious natural harbour, of which Stranraer is the port. The surface is generally hilly and the rivers are mostly small, the chief being the Cree, bounding with Kirkcudbrightshire, the Bladenoch, Tarf and Luce. Oats, barley, wheat, potatoes and turnips are the principal crops, and live-stock are raised, Galloway cattle being in considerable request. Dairy-farming has been extensively developed on scientific lines. The manufactures are comparatively insignificant. Wigtown (1,386) is the capital. Pop. (1901), 32,685.

Wilberforce, **SAMUEL**, Bishop of Winchester, was the son of William Wilberforce, and was born

at Clapham on September 7th, 1805, and educated privately and at Oriel College, Oxford. He was ordained in 1829. In 1841 he was appointed Bampton Lecturer, and in 1845 Dean of Westminster. In the same year he was raised to the see of Oxford. A year previously he had issued his *History of the Protestant Episcopal Church in America*, a useful and interesting book. In 1869 he became Bishop of Winchester. In 1870 he published *Heroes of Hebrew History*, and in 1874 his *Essays Reprinted from the Quarterly Review*. He was killed by a fall from his horse at Abinger, near Dorking, on July 19th, 1873.

Wilberforce, **WILLIAM**, philanthropist and reformer, was born in Hull, England, on August 24th, 1759, and was educated in Hull and St. John's College, Cambridge, where he graduated with distinction. On reaching his majority he became entitled to a large fortune, and, entering Parliament as an independent member, served the cause of reform very ably, gradually obtaining a reputation for eloquence. He now grew deeply religious, a frame of mind which lasted as long as he lived. He had many years before formed opinions against the slave trade, and after getting into Parliament he worked zealously for its abolition. In 1789 he introduced a Bill for its suppression, and though well supported did not succeed for the time. In 1804 the Bill passed the Commons but was rejected by the Lords, and in 1807 it finally passed through both Houses. In 1825 he retired from Parliament owing to failing health, and towards the end of his life suffered some heavy pecuniary reverses. He died in London on July 29th, 1833, just three days after the Government voted the sum of twenty millions for the entire abolition of slavery, and was buried in Westminster Abbey. In 1797 he published his *Practical View of Christianity*.

Wild Birds. Certain wild birds in the United Kingdom are protected during the breeding season by the Wild Birds Protection Act, 1880. This Act was altered in regard to an exception for birds received from abroad, and by the insertion of larks in the schedule of protected birds by the Wild Birds Protection Act, 1881.

Wild Duck, the Mallard (*Anas boschas*). [Duck.] The term may include the Teal, Garganey, Widgeon, Harlequin Duck, and its close ally the Garrot, or Golden-eye, the Sheldrake, Shoveller, etc., or, indeed, any duck, British or foreign, that is not domesticated.

Wilde, **OSCAR O'FLAHERTIE WILLS**, essayist, poet and dramatist, was born in Dublin on October 15th, 1856, and educated at Enniskillen, Trinity College, Dublin, and Magdalen College, Oxford. He soon became known for his wit and his advocacy of the new æsthetic cult, of which he was the founder. His lectures in the United States (1882) and his essays in various periodicals were marked by finished style and brilliance and audacity of paradox. In 1888 he wrote *The Happy Prince*, a volume of charming fairy tales, and his *Picture of Dorian Gray* acquired notoriety by its ugly suggestiveness. Though his first efforts for the stage

were not successful, his *Lady Windermere's Fan* (1892), *A Woman of No Importance* (1893), *The Ideal Husband* (1895), and *The Importance of Being Earnest* (1895) gave him an assured place amongst leading playwrights. His drama of *Salome* (1893), forbidden in London by the Censor, was produced in Paris next year, with Sarah Bernhardt in the title-rôle. His career came to an abrupt conclusion when he was sentenced, at the Old Bailey in London, on May 27th, 1895, to two years' imprisonment. While in prison he produced his "Ballad of Reading Gaol" (1898). The melancholy collapse of his reputation broke his health, and he died in Paris on November 30th, 1900.

Wild-Fowl, a collective term equivalent to Wild Duck; applied also to Water-Fowl valued for food or for the sport they afford. The decoy, now rapidly going out of use, consisted of numerous channels, growing narrower by degrees, extending from a piece of open water. Into these channels, covered with network of some kind, wild-fowl were induced to enter by tame decoy birds, or by scattering food. Once in, they were driven towards the small end by trained dogs on the bank, and were then easily taken.

Wilkes, JOHN, politician, was born on October 17th, 1727, in Clerkenwell, London, where his father was a rich distiller, and obtained his education at Leyden University. At the age of twenty-two he married an heiress, from whom he was separated after a year or so. He retired to Buckinghamshire and became its High Sheriff, and in 1757 was returned to Parliament as M.P. for Aylesbury, making himself very conspicuous by his reckless attacks on all those from whom he in any respect disagreed. He started a paper called *The North Briton* in 1762, which was seized in the following year, and he was imprisoned in the Tower for a violent diatribe, in the famous No. 45, against the king. As the arrest was unconstitutional, he was released and obtained damages. In 1764 he was expelled from the House of Commons and was again tried for republishing *The North Briton*, and for circulating an obscene poem, the *Essay on Woman*. He fled to France, and was attainted. He was, however, popular with the masses, and on his return in 1768 was elected M.P. for Middlesex, and after five expulsions and re-elections took his seat in 1774, when he also became Lord Mayor. He died in London on December 20th, 1797.

Wilkie, SIR DAVID, painter, was born at Cultra, Fifeshire, Scotland, on November 18th, 1785. His career was foreshadowed even from the nursery, the walls of which he covered with drawings in chalk. He studied at the Trustees' Academy in Edinburgh and in 1804 produced his "Pitlessie Fair." Next year he went to London where, with "The Village Politicians" (1806), "The Blind Fiddler" (1806), "The Village Festival" (1812) and other works of *genre* or illustrative of manners and customs, he speedily acquired the highest position amongst the artists of the day. In 1809 he was elected A.R.A. and a full member in 1811. His reputation was enhanced by "Blind Man's Buff"

(1813), "The Penny Wedding" (1818), "The Reading of the Will" (1819), and "Chelsea Pensioners Reading the Gazette of the Battle of Waterloo" (1821). This was the last fine picture of his first and best manner. Domestic and other troubles having undermined his health, he undertook several tours on the Continent, and while in Spain came so completely under the spell of the great Spanish masters that he wholly changed his style. To his second period belong "The Maid of Saragossa" (1827), "John Knox Preaching before the Lords of the Congregation" (1832), "Napoleon and the Pope at Fontainebleau" (1836), and "Sir David Baird discovering the Body of Tippoo Sahib" (1838). Wilkie was knighted in 1836. In 1840 he set out on a tour to the East and died at sea, homeward bound, on June 1st, 1841—his burial forming the subject of the famous picture by J. M. W. Turner.

Will. A will is a written instrument by which the person making it (who is the testator) provides for the distribution or administration of his property after his death. It does not take effect until the testator's death, and is always revocable. A person having testamentary capacity may dispose by will of all real and personal estate to which he is or shall become entitled, and which, if not so disposed of, would devolve upon his heir, executor, or administrator. No particular form of words is required to make a valid will, so long as the testator's intention can be ascertained; otherwise its provisions will fail for uncertainty. A will must be signed at the foot or end by the testator, or by some one in his presence and by his direction, and the signature must be made or acknowledged by the testator in the presence of at least two witnesses, who must be present together at the same time, and must attest and subscribe the will in the presence of the testator. A devise or bequest to an attesting witness does not affect the validity of the will, but such devise or bequest is void. Every will is construed with reference to the real and personal property comprised in it, to speak and take effect as if it had been executed immediately before the death of the testator, unless a contrary intention shall appear. See the "Wills Act, 1837"; it does not extend to Scotland. [EXECUTOR.]

Will, that faculty in man which controls some of his muscular movements, and to some extent his thoughts and even his feelings. The question how far man in his actions is independent of external circumstances is one that has occupied thinkers from the earliest dawn of philosophy.

William I., THE CONQUEROR, King of England, son of Robert the Devil, Duke of Normandy, and the daughter of a tanner, was born at Falaise, Normandy, in 1027 or 1028. He succeeded his father at the age of eight, and was almost at once threatened by the serious revolts of the nobility, who finally broke out in open rebellion, which was not ended till 1054, when William gained a notable victory at Mortemer. He later gave a serious check to France, and in 1063 obtained possession of Maine and in 1064 of Brittany. His illegitimacy

did not prevent William from claiming the throne of England, basing his pretence on a slight relationship through his grandfather's sister. On hearing of the accession of Harold (January 6th, 1066) after the death of the Confessor, he immediately prepared to invade England and landed at Pevensey on September 28th, 1066. He defeated Harold at Battle, near Hastings, on October 14th, 1066, but did not reach the throne without a further struggle. On Christmas Day he was crowned at Westminster King of England, but troubles soon arose. William, who had returned to Normandy in a deceptive moment of peace and order, came back and by unexampled severity managed to obtain paramount power, and the Norman conquest was complete. He died at Rouen on September 9th, 1087, from the effects of a fall from his horse four weeks before.

William II., King of England, surnamed **RUFUS** or the Red, was the third son of the Conqueror, and was born in Normandy between 1056 and 1060. He came to England on his father's death, and was placed on the throne mostly through the influence of Lanfranc, in flagrant opposition to the rights of his eldest brother Robert, being crowned at Winchester on September 8th, 1087. The barons rose against the usurpation, but were repulsed. The king governed cautiously for some years, but after Lanfranc's death in 1089 he acted in an unconstitutional and arbitrary manner. He declined to fulfil his promise as to the restoration of Edward the Confessor's laws, and, instead of appointing bishops and other prelates when vacancies occurred, left the positions unoccupied, and estricted the revenues. He was shot dead with an arrow in the New Forest by Walter Tyrrell on August 2nd, 1100.

William III., King of England, the only son of William II., Prince of Orange (whose title he assumed), and Mary, daughter of Charles I., was born at The Hague, Holland, on November 4th, 1650. He rose to high command in the United Provinces, becoming in 1672 Captain and Admiral-General, and the British and French, with whom he was then at war, offered to agree to his becoming despotic ruler of his states, but the proposal was declined. His Protestantism made him popular in England, where James II.'s conduct was causing grave dissatisfaction. William strongly opposed James after a time, and was finally invited to England. He landed with an army at Brixham on Torbay on November 5th, 1688. Thereupon James fled to France, and William insisted upon his full rights as king, which were granted after some hesitation, and he was crowned on April 11th, 1689. Both Ireland and the Highlands of Scotland still clung to James from religious motives. On July 1st, 1690, James was defeated at the battle of the Boyne; in the following year Limerick was surrendered, and Ireland was rendered comparatively peaceful. Queen Mary, whom he had married on November 4th, 1677, died in 1694, and for several years the king was at warfare with Louis XIV. of France, who had deliberately broken a treaty concerning Spain. On the eve of a fresh campaign,

William fell from his horse while riding in Hampton Park and died at Kensington Palace on March 8th, 1702.

William IV., King of Great Britain and Ireland, third son of George III. and Queen Charlotte, was born in Buckingham Palace, London, on August 21st, 1765. He was brought up as a naval officer, and served for some years under Rodney and Nelson, taking part in actions against the French, Spaniards and Americans. He married, on July 18th, 1818, the Princess Adelaide of Saxe-Coburg-Meiningen, and succeeded to the Crown in 1830, being crowned at Westminster on September 8th, 1831. He died at Windsor on June 20th, 1837.

William, surnamed **THE SILENT**, Prince of Orange, was born at the castle of Dillenburg, in Nassau, on April 16th, 1533. In 1544 he inherited from his cousin the principality of Orange and family estates in the Netherlands. He was educated at Brussels as a Catholic, and his attainments and capacity soon won the attention of Charles V. When Henri II. of France disclosed his plan for the massacre of all the Protestants in France and the Low Countries, the Prince, though horror-stricken, showed such discretion that he was named the Silent—a *sobriquet*, however, which conveys a wrong impression of his character, which was that of a frank, open, generous statesman. The unceasing persecution of the Protestants ultimately induced the Prince to make common cause with them. In 1574 he had much of Holland inundated, was able to relieve the siege of Leyden, and by his patience and courage infused such spirit into the people that Don John of Austria, the Spanish Regent, was glad to come to terms. Resentment against the Spanish rule still smouldered and the Union of Utrecht, signed by five of the Northern Provinces on January 23rd, 1579, founded the Republic of the Netherlands. In 1580 Philip II. of Spain set a price on the Prince's head and next year the United Provinces formally threw off their allegiance to Spain. But the Prince continued to be in danger, and was shot dead in his house at Delft on July 10th, 1584.

William I., King of Prussia and first German Emperor, descended from the Electors of Brandenburg, was the second son of Frederick William III. of Prussia and was born at Berlin on March 22nd, 1797. His elder brother having no issue, he became, in due course, heir-presumptive to the throne. In 1819 he married Princess Augusta of Saxe-Weimar. On his father's death in 1840 he was appointed Governor of Pomerania and, whilst his brother, Frederick William IV., was in England in 1842, acted as Regent of Prussia. Owing to his opposition to reform during the Revolutionary epoch of 1848 he was obliged to leave Berlin and take refuge in England, but was recalled in two months. In 1858 he was again appointed Regent, and devoted himself to the organisation of the army. In conjunction with Moltke and Roon, he brought it to a splendid state of efficiency. On January 2nd, 1861, he became King of Prussia, and

in 1862 he gave Bismarck the appointment of Prime Minister, with *carte blanche* to carry out, constitutionally or otherwise, the system which had been adopted by the king and his generals. Bismarck accomplished this task by "blood and iron," and the Prussians were saddled with immense expenditure in order that the army should be kept fully equipped. The result was seen in the Seven Weeks' War with Austria in 1866. On the outbreak of war with France in 1870 Germany stood solid, and on January 18th, 1871, William was proclaimed German Emperor at Versailles. For the rest of his life he was content to leave all questions of administration to his masterful minister. He died in Berlin on March 9th, 1888.

William II., King of Prussia and German Emperor, eldest son of Frederick III., by his marriage with Victoria, Princess Royal of England, was born in Berlin on January 27th, 1859. In 1881 he married Princess Augusta Victoria of Schleswig-Holstein. He succeeded to the throne on June 15th, 1888, and shortly afterwards dismissed Prince Bismarck. In 1889 he visited the Sultan at Constantinople and in 1898 repeated the visit, proceeding afterwards to the Holy Land. In 1895 he aroused much hostility in England by his congratulatory telegram to President Kruger on the collapse of the Jameson Raid, but in 1901, by his action on the death of Queen Victoria, he regained his popularity, which was increased during his stay in England in 1907. It has been his studied policy to stand well with Edward VII., the Emperors of Russia, Austria, and the King of Italy. He has even made friendly overtures to France. His personality is picturesque, but he is apt to see possible dangers, as in the case of the Yellow Peril, through a magnifying-glass.

Williams, JOHN, missionary, was born at Tottenham, near London, on June 29th, 1796, and in 1816, after finishing an apprenticeship to an ironmonger, went to the South Seas in order to assist in missionary work. There he spent the greater part of a noble life, zealously working amongst the natives and spreading the truths of Christianity. In 1834 he returned to England to secure support for his schemes for developing missionary labour, and in 1839 sailed again for the Pacific Islands. Landing at Erromanga on November 20th, 1839, he was killed and eaten by the natives. His *Narrative of Missionary Enterprise in the South Sea Islands* (1837) had a great circulation.

Willow, the general English name for the genus *Salix*, the type of the order Salicaceæ, which belongs to the Incompletæ. The genus is a large and very difficult one, comprising upwards of a hundred species of trees and shrubs, some of the latter being very minute. They belong mainly to northern temperate or arctic climates and to moist situations, the difficulty of discriminating the species being enhanced by the differences between male and female trees, as they are dioecious, and by hybridisation, which occurs freely in the wild state. They all agree in having deciduous, scattered, simple, stipulate leaves, and their flowers in catkins. These are

often precocious, the pollen being carried both by wind and by insects attracted by perfume, honey, and the conspicuous yellow anthers, or ovaries silvery with hair. Each male flower consists of a single bract, a small nectary, and two, three, five, or (very rarely) more stamens. Each female flower has a similar bract, distinguished from that in poplars by not being notched, and a shortly-stalked ovary of two carpels, one-chambered, many-seeded, hairy externally, and furnished with a short terminal style and two stigmatic lobes. The seeds are exalbuminous and have each a coma or tuft of long silky hairs springing from the base. They grow quickly, forming a soft white wood, which does not splinter, and is used for wheelbarrows, the floors of waggons, cricket-bats and other purposes. It also furnishes a good gunpowder-charcoal.

Willow-Herb, the popular name of the genus *Epilobium*, originating from the long lanceolate willow-like leaves of most of the species. They possess, it so happens, another resemblance to willows, with which they have no affinity, in their seeds, each of which is furnished with a tuft or coma of hairs. The genus belongs to the Onagraceæ, and includes about fifty species, of which about a dozen are British. Their leaves, unlike those of willows, are exstipulate; they have four valvate calyx-segments; four, red or pink, contorted petals; eight stamens; and an inferior ovary, elongating into a long pod-like valvularly dehiscent fruit.

Wilmington, the capital of Newcastle county, Delaware, United States, on the Delaware, 27 miles S.W. of Philadelphia. Situated on high ground commanding fine views of the river, the town is the leading commercial and industrial centre of the state. Amongst the principal structures are Government Building, the Court House, the Friends' School, the Natural History Association and several charitable and educational institutions. The Swedes' Church, dating from 1698, indicates the site of the oldest Swedish colony in the Delaware valley. The industries include shipbuilding, engineering, and the manufacture of iron and steel, railway plant, paper, carriages, leather, textiles and flour. It has a speciality in the making of powder, the factories being amongst the most considerable in the world. Pop. (1900), 76,508.

Wilmington, the capital of New Hanover county, North Carolina, United States, on the left bank of the Cape Fear, 20 miles from the river's mouth on the Atlantic. The principal buildings comprise Federal House, the City Hall, National Marine Hospital, the City and County Hospital and the Masonic Temple. The leading industries include dyeing and lumbering, and the manufacture of railway plant, textiles, cotton-seed oil, fertilisers, oils and paints. Being an important shipping centre, it does a large export trade not only in its own products but also in those of the state. Pop. (1900), 20,976.

Wilson, ALEXANDER, astronomer and type-founder, was born at St. Andrews, Fifeshire, in

1714, and educated at the University of his native place. In 1737 he became assistant to a surgeon in London, but having remarked an opening for the improvement of the types used in letterpress-printing, he gave up his profession and opened a type-foundry at St. Andrews in 1742, removing it two years later to Camlachie, in Glasgow. He provided the types for the well-known printers, the brothers Foulis, his Greek fonts being of noteworthy beauty and finish. Through the influence of the Duke of Argyll, he was appointed in 1760 first Professor of Practical Astronomy in Glasgow University. He occupied the chair for twenty-four years and died in Edinburgh on October 18th, 1786. In 1769 he established the fact that solar spots are cavities in the luminous matter enveloping the sun.

Wilson, ALEXANDER, ornithologist, was born at Paisley, Renfrewshire, on July 6th, 1766, and educated in a local school. He was apprenticed to the weaving and settled at Lochwinnoch for a time, afterwards travelling the country as a pedlar. His literary tastes had meanwhile developed, and in 1790 he published a volume of *Poems, Humorous, Satirical and Serious*. He corresponded with and visited Robert Burns, to whom his poem of "Watty and Meg" (which appeared anonymously in 1792) was at first ascribed. Imprisoned for the issue of a satire against "a Paisley body," he sailed to the United States and landed at Newcastle, Delaware, on July 14th, 1794. He followed different occupations for a living, being in succession copperplate-printer, weaver, teacher and draughtsman. His innate love of Nature and his considerable artistic skill at last found their proper vent in *The American Ornithologist*, the first volume of which came out in 1808. The hardships to which he was exposed whilst wandering over the continent in search of materials for his work undermined his health and he died at Philadelphia on August 23rd, 1813. Though his work is unsystematic and weak on the scientific side, his observations and descriptions contain much that is important and readable.

Wilson, SIR DANIEL, antiquary and educationist, was born in Edinburgh on January 5th, 1816, and educated at the Royal High School and University of his native city. He proceeded to London in 1837 with the intention of taking up journalism, but returned to Edinburgh in five years and devoted himself to archaeology, for which he had a particular liking. In 1845 he became honorary secretary to the Scottish Society of Antiquaries, and in 1847 published his admirable *Memorials of Edinburgh in the Olden Time*, illustrated by himself. Next year his popular book on *Oliver Cromwell and the Protectorate* appeared, and in 1851 he brought out his principal work, *The Archaeology and Prehistoric Annals of Scotland*. Appointed in 1853 Professor of History and English Literature in the University of Toronto, he paid special attention to the educational requirements of the Dominion. In 1860 he was elected President of the Canadian Institute and two years afterwards issued his *Prehistoric Man: Researches into the Origin of Civilization in the Old and New Worlds*. This was followed by *Chatterton* (1869), *Caliban*,

the Missing Link (1873), *Spring Wild Flowers* (a volume of verse, 1875), *Anthropology* (1885) and *The Right Hand: Lefthandedness* (1891). He became President of Toronto University in 1881, was knighted in 1888, and died at Toronto on August 6th, 1892. The National Portrait Gallery of Edinburgh contains his portraits by Sir George Reid—a remarkable work of art, consisting of two profile portraits and one full-face on one canvas, the three portraits painted on three successive days. Otherwise the work is noteworthy: the likenesses are speaking and the technique is masterly.

Wilson, JAMES, political economist, was born at Hawick, Roxburghshire, on June 3rd, 1805, and educated at Friends' schools at Ackworth and Earl's Colne (in Essex). He was apprenticed to a hat manufacturer of Hawick, but continued his studies in his leisure. After he started in business for himself he sought a wider field for his energies in London in 1824. He prospered until large speculations in indigo (1836) led to bankruptcy, but in due course he succeeded in paying his creditors in full and retired from business in 1844. Meanwhile he had acquired the reputation of being one of the foremost financiers of his day. His *Influences of the Corn Laws as affecting all Classes of the Community* (1839) demonstrated that duties on corn benefited no interest whatever and had great weight with Richard Cobden. In his *Fluctuations of Currency, Commerce and Manufactures* (1840) he showed the detrimental effects generally of the Corn Laws and in his pamphlet *The Revenue, or What shall the Chancellor do?* (1841), he outlined much of the Budget legislation and financial measures adopted in later years by Sir Robert Peel and William Ewart Gladstone. In 1843 the City article and occasional leaders contributed to *The Morning Chronicle* directed his attention particularly to journalism, and in the same year he founded and edited *The Economist*, which immediately took the leading rank in the financial press. During several years he sat in the House of Commons, first for Westbury and afterwards for Devonport. From 1853 to 1858 he was Financial Secretary to the Treasury, and had hardly settled down (1859) as Vice-President of the Board of Trade and Paymaster-General and Privy Councillor, when he accepted, on public grounds, the post of Financial Member of the Council of India, which had just been created. He had inaugurated comprehensive plans for the reform of taxation and the institution of paper currency, when he was seized with dysentery and died at Calcutta on August 11th, 1860.

Wilson, JOHN, poet, was born at Lesmahagow, Lanarkshire, on June 30th, 1720, and educated at Lanark Grammar School. At the age of twenty-six he was appointed schoolmaster of his native parish; in 1764 he removed to Rutherglen, near Glasgow, to become private tutor in certain families, and in 1767 was made master of Greenock Grammar School, on the condition that he gave up "the profane and unprofitable art of poem-making." Versification was likely to continue unprofitable if

the spirit that animated these Trustees prevailed. The proviso had reference to Wilson's dramatic sketch entitled *Earl Douglas* (1760), which he reissued in 1764 along with *The Clyde*, which John Leyden afterwards characterised as "the first Scottish loco-descriptive poem of any merit." Wilson meekly acquiesced in the intolerant proviso and burned his manuscripts. He died in Greenock on June 2nd, 1789. To mark its sense of the heroism displayed by his eldest son James, a sailor, who was killed during the engagement on Lake Champlain in 1776, in the American War of Independence, the Government conferred a small pension on the poet.

Wilson, JOHN, novelist, poet and critic, better known as "Christopher North," was born at Paisley, Renfrewshire, on May 18th, 1785. He studied at Glasgow University and Magdalen College, Oxford, graduating at the latter in 1807. He settled at Ellera near Windermere, where he became acquainted with Wordsworth and Coleridge and in 1810 was married. In 1812 he published a poem, *The Isle of Palms*, which is in parts of great merit, and in 1816 his *City of the Plague* appeared. A year previously he had been admitted a member of the Scottish bar, but did not seriously follow the legal profession. In 1817 *Blackwood's Magazine* was started in a spirit of strong hostility to the Whigs, and, aided by Wilson, Maginn, Lockhart and Hogg, it soon became famous. Wilson's slashing style and rough, leonine personality can never be dissociated from it. His *Noctes Ambrosianae* and *Lights and Shadows of Scottish Life* constituted his most permanent contribution. In 1820 he became Professor of Moral Philosophy at Edinburgh University, a post for which his qualifications were of the narrowest, although he proved equal to the demands made upon him and had ample leisure for literary work. He died in Edinburgh on April 3rd, 1854.

Wilson, JOHN MACKAY, man of letters, was born at Tweedmouth, Northumberland (a suburb of Berwick, on the right side of the river), on August 15th, 1804, and educated there. After finishing his apprenticeship to a Berwick printer, he went to London, where ill luck persistently dogged him. Afterwards he spent some time in the provinces lecturing on English literature, and in 1832 was appointed editor of *The Berwick Advertiser*. He died at Berwick on October 2nd, 1835, and was buried in Tweedmouth Churchyard. He wrote one or two dramas (*The Gowie Conspiracy*, 1829, was the best) and a few poems of little or no account, but earned immediate and quite remarkable, though thoroughly deserved, popularity by his series of *The Tales of the Borders*. These appeared in weekly numbers, and were continued after his death by his brother and Alexander Leighton (1800-1874), but the stories furnished by the projector won the greatest admiration.

Wilson, MARGARET, martyr, elder daughter of Gilbert Wilson, a yeoman of Penninghame, was born at Glenvernock, Wigtownshire, in 1667. Though their parents accepted Episcopacy, neither Margaret nor her younger sister Agnes would yield

and, along with Margaret MacLachlan, a woman aged 63 years, they were tried at Wigtown Assizes in 1685 for Covenanting and rebellion (!). They declined to take the Abjuration Oath and all three were sentenced to be fastened to stakes within the flood-mark of Bladenoch Water to be drowned. Agnes was bailed out by her father for £100, but her sister and the older woman were duly drowned



THE MARTYRS' MONUMENT IN STIRLING CHURCHYARD.

on May 11th, 1685. David Graham, a brother of Claverhouse, was one of the judges. Care was taken that Margaret MacLachlan should perish first in the hope that her fate would shake the fortitude of the other victim, but this design of their murderers was of no avail. Professor John Stuart Blackie wrote a moving ballad on "The Two Meek Margarets," and Sir John Everett Millais, P.R.A., made "The Martyr of the Solway" the subject of a picture, now in the Walker Art Gallery in Liverpool. One of the most beautiful monuments in Stirling Churchyard is an idealistic tribute in sculptured figures to the constancy of the martyrs. All attempts made to prove that the infamous sentence was never executed have failed.

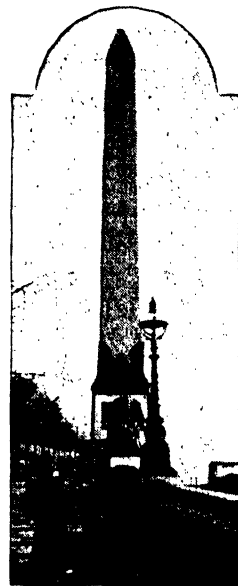
Wilson, RICHARD, painter, was born at Pene-goes, Montgomeryshire, Wales, on August 1st, 1714, and studied art in London. He began his career with portraiture, but the years which he spent in Italy between 1749 and 1755 converted him to landscape. In this branch he displayed such breadth of treatment and nobility of design, with

such sense of atmosphere and such rich colour that he is now regarded as the first great landscape-painter of the British School. He was an original member of the Royal Academy (1768), to which he regularly contributed till 1780 and of which he became librarian in 1776. He died near Llanberis on May 15th, 1782. Among many pictures may be named his "Mæcenæ's Villa," "Niobe," "Snowdon," "Lake of Nemi," "Cicero's Villa," "Apollo" and "Meleager and Atalanta."

Wilson, ROBERT, engineer, was born at Dunbar, Haddingtonshire, in 1803. After a scanty education he was apprenticed to a joiner. While yet a youth he had thought out a method of propelling vessels (his father was a fisherman) and in 1827 his model was submitted to the Earl of Lauderdale, who deemed it practicable. The Highland Society purchased the model for £10, and in 1832 the Scottish Society of Arts gave Wilson their silver medal. The invention was then brought before the Admiralty which, after the customary official delays and discourtesy, declined it, though in 1840 it accepted the similar invention of Sir Francis Pettit Smith. (In 1860 Wilson published a pamphlet *The Screw Propeller: Who Invented It?* reciting all the facts of the case.) In 1838 Wilson removed from Edinburgh to Manchester to become manager of James Nasmyth's foundry at Patricroft. Later he assisted Nasmyth in perfecting the steam-hammer, and a few years afterwards constructed the great double-acting hammer at the Royal Arsenal, Woolwich. He patented numerous valves, pistons, propellers and hydraulic and other machinery and was joint-inventor, with Nasmyth, of the hydraulic packing-press. He died at Matlock, Derbyshire, on July 28th, 1882.

Wilson, SIR WILLIAM JAMES ERASMUS, commonly called **SIR ERASMUS WILSON**, surgeon and physician, was born in Marylebone, London, on November 25th, 1809, and educated at Dartford and Swanscombe. At an early age he assisted his father, a native of Aberdeen who had finally settled in practice as a surgeon in Dartford and Queenhithe, in Kent. He afterwards attended John Abernethy's anatomical lectures at St. Bartholomew's Hospital and in 1831 became a member of the Royal College of Surgeons. For a time he acted as prosecutor in anatomy and physiology to Jones Quain and afterwards as demonstrator to Richard Quain, Jones Quain's brother. In 1840 he not only lectured in these subjects himself at Middlesex Hospital but undertook the sub-editor's post on *The Lancet*. Thenceforward he specialised in skin diseases and founded in 1869 the chair of Dermatology at the College of Surgeons, of which he was elected Fellow in 1843 and President in 1881. He was himself the first Professor of Dermatology, occupying the post from 1869 to 1877. He was knighted in 1881 and died at Westgate-on-Sea on August 7th, 1884. His chief works were *Practical and Surgical Anatomy* (1838), *The Anatomist's Vade Mecum* (1840), *A Practical and Theoretical Treatise on Diseases of the Skin* (1842) and *The Eastern or Turkish Bath* (1861). He founded a scholarship at the Royal College of

Music and the chair of Pathology at Aberdeen University, was a munificent supporter of the Royal Medical Benevolent College at Epsom and of the Sea-Bathing Infirmary at Margate, and, on his widow's death, his property, of the value of £200,000, reverted to the Royal College of Surgeons. He was popularly known principally in connection with the transport of Cleopatra's Needle from Egypt to London, the cost of which (£10,000) he bore. The Needle was raised on the Thames Embankment, but its effect was impaired by the erection of a sphinx on each side, the sphinx being made to turn towards the obelisk instead of away from it.



CLEOPATRA'S NEEDLE.
(Photo: Pictorial Agency.)

Wilton, a town of Wiltshire, England, 3 miles N.W. of Salisbury, near the confluence of the Nadder and Wiley. It is a place of remote antiquity, being supposed to have been the capital of the British prince Carollus and a seat of the West Saxons. Near it Alfred the Great encountered the Danes in 871. It was incorporated before the reign of Henry I., was visited by Queen Elizabeth in 1579 and was the residence of the Court for some time in 1603. The chief building is the Romanesque church of St. Mary and St. Nicholas, erected in 1844, to take the place of the old one, by Lord Herbert of Lea and the Countess of Pembroke. The leading industry is carpet-making, both Wilton and Axminster carpets being manufactured. Felt for pianofortes is also made, and an important sheep fair is held every September and a fair for horses, cattle and sheep every May. Wilton House occupies the site of Wilton Abbey, which was granted to Sir William Herbert, afterwards Earl of Pembroke, by Henry VIII. It was designed by Holbein and Inigo Jones and is noted for its art treasures, amongst them being several fine examples of Van Dyck. Here Sir Philip Sidney is said to have written *Arcadia*. Pop. (1901), 2,203.

Wiltshire, or **WILTSH**, a county in the south-west of England, occupying an area of 1,350 square miles, bounded on the N.W. and N. by Gloucestershire, on the E. by Berkshire and Hampshire, on the S. by Hampshire and Dorset and on the W. by Somerset. The Vale of Pewsey divides it, the northern half flat and fertile, rising gradually to the Cotswold Hills, whilst the southern district is broken by a succession of downs and

rich valleys, except in the neighbourhood of Salisbury Plain. The chief rivers are the Upper and Lower Avon, with their tributaries, and the

belonging to the college of secular canons founded here in 1043 by Edward the Confessor. The most notable features of the structure



Photo]

WILTON: WILTON HOUSE.

[*Ed. Wilkinson, Trowbridge.*

Kennet. Dairy-farming and sheep-breeding are the leading industries, and the county is famous for cheese and bacon. There are carpet and woollen cloth factories at Bradford, Trowbridge, Westbury and Wilton, and the works of the Great Western Railway at Swindon. Ironstone is abundant, and foundries exist at Devizes, while cutlery is made at Salisbury, the capital. Stonehenge is the principal centre of antiquarian interest. Pop. (1901), 271,394.

Wimbledon, a town of Surrey, England, $7\frac{1}{2}$ miles S.W. of London. The Common was the annual meeting-place of the National Rifle Association from 1860 till 1889, when the venue was removed to Bisley, and contains a beautiful lake called Queensmere and the site of an earthwork known as Caesar's Camp. The London Scottish and Wimbledon golf clubs play over the Common. The town is practically a residential quarter of London. Pop. (1901), 41,652.

Wimborne, or **WIMBORNE MINSTER**, a town of Dorsetshire, England, at the confluence of the Allen (Wim) and the Stour, 6 miles N. of Poole. It was a place of considerable consequence in the times of the Romans and Saxons. The noble minster was the collegiate church of St. Cuthberga,

are the Early English choir and presbytery, the Norman choir, St. George's aisle (in which lies the parish chest containing records going back



WIMBORNE: THE MINSTER.

(*Photo: Frith & Co., Reigate.*)

to 1475), Trinity aisle, and, at the intersection of the transepts, the massive Norman piers and arches sustaining the central tower. Attached to the

Trinity aisle is a Decorated vaulted sacristy and over it the Decorated library in which are kept several specimens of chained books. The Free Grammar School was founded by the Countess of Richmond, mother of Henry VII., re-established by Queen Elizabeth and now administered under the Charity Commissioners. Coach-building and the manufacture of woollen hose and buttons are the chief industries. Pop. (1901), 3,696.

Winch is a practical application of the wheel and axle. A barrel or drum is rotated by means of a cranked handle and intermediate toothed or other gearing arranged to give considerable mechanical advantage, and on this barrel a rope or chain may be wound. In a steam-winch a small engine is geared to the barrel. The term winch is also sometimes applied to a cranked handle.

Winchelsea, a decayed town of Sussex, England, 2 miles S.W. of Rye. The original town, one of the Cinque Ports, stood three miles to the south-east and was overwhelmed by the sea in the 13th century. The new town was built in the form of a square on the summit of a low, broad-topped hill and is famed for the ivy-clad church of St. Thomas, a good example of the Early English and Decorated styles, and its two old gateways. Camber Castle, in the vicinity, dates from the reign of Henry VIII.

Winchester, a city of Hampshire, England, on the Itchin, 12 miles N.E. of Southampton. It is one of the oldest cities in England, was known as *Caer Gwent* (White City) in Celtic times, as *Venta Belgarum* under the Romans, and as the *Saxon Winton* when it became *Cerdic's* capital. The first cathedral was completed in 602 when the see was instituted, but the existing structure dates from the close of the 11th century. Among other interesting buildings are the Chapel of the Castle containing the so-called Round Table of King Arthur, the house of the Knights Templars, Charles II.'s palace, and several venerable churches, but a structure of prime importance is St. Mary's College, founded by William of Wykeham, in 1387, and now one of the chief public schools of England. Outside the town is the curious Hospital of St. Cross (1132). Pop. (1901), 20,929.

Winchester, a town of Virginia, United States, 80 miles N. by W. of Washington, and about 14 miles from the left bank of the Shenandoah. It was the scene of several conflicts during the Civil War. On March 23rd, 1862, the Federals under James Shields defeated the Confederates under "Stonewall" Jackson, four miles to the south; on July 24th, 1864, the Confederates, under Jubal Anderson Early, repulsed the Federals under George Crook; on September 19th, 1864, Philip Henry Sheridan avenged the Northerners by defeating Early on the Opequan and again (September 22nd) at Fisher's Hill, while finally (October 19th) Sheridan hurried up just in time to gain a decisive victory over Early, whose surprise attack at Cedar Creek, 20 miles south-west of the town, threatened disaster to the Federals. The chief buildings are Fairfax Hall College, the Valley Female College

and the Shenandoah Valley Academy. The manufactures include textiles, paper, lumber, flour, spirits, gloves and leather. Pop. (1900), 5,161.

Wind is merely moving air, and the velocity with which it moves is approximately proportional to the closeness of the isobars. [WEATHER.] Instruments for measuring the velocity of the wind are known as anemometers, and the same name is given to those which measure the pressure. The pressure of the wind is, however, a difficult thing to deal with, and no rigid connection has been found between it and the velocity. The latter varies from a few miles an hour in a faint breeze to 20 miles an hour in a steady one; 40 miles an hour will occur in a gale, and as the speed rises the gale increases in destructiveness and merges into a hurricane. For use at sea Rear-Admiral Sir Francis Beaufort (1774-1857) designed a scale of wind, based on the amount of canvas which a ship could carry, and the number of feathers in the arrows of synoptic charts are drawn on this scale. A calm is indicated by 0, while winds of varying intensity are divided into 12 groups, the twelfth being such that the ship could carry no canvas whatever. Since difference of temperature at two places causes difference of pressure, winds are indirectly due to the former. Air from the warmer place, being relatively light, will ascend, while colder and denser air will flow in from the colder region to fill its place. This, carried on a very large scale, is the cause of the trade winds. The whole of the tropics become heated more than the temperate zones, so the air there ascends, while a breeze from the north and south sets in towards the heated belt. If the earth were not rotating, there would be a wind from the north in this hemisphere, and one from the south in the southern world. But the rotation of the earth alters this direction; while a place on the equator is travelling round with the velocity of 1,020 miles an hour, the speed is only half this on the 60th parallel, and nothing at the poles. The wind, then, is coming from a place moving from west to east slowly to a place moving much faster. Each place that it reaches is travelling from west to east faster than itself; it therefore gets left behind, as it were, and seems to the inhabitants of the places to be blowing east. In the northern hemisphere it is, therefore, partially a north and partially an east wind, a north-east wind being the result. In the southern hemisphere the trade-wind is south-east. The trade winds are specially noticeable in the Atlantic and Pacific Oceans, where they blow from about the 30th parallel to the equator, a difference of latitude of a few degrees occurring between the two oceans and the two hemispheres. The trade winds from the north and south meet in a belt about 4° wide in the tropics, and this is known as the Region of Calms, called by sailors the Doldrums.

Wind-change, DOVE'S LAW OF, postulates the doctrine that the system of atmospheric currents obeys the influence of the earth's rotation. Heinrich Wilhelm Dove was born at Liegnitz in Prussian Silesia on October 6th, 1803, and died in Berlin on April 4th, 1879. He was a leading authority on meteorology, climatology and the atmosphere.

Windermere, or WINANDERMERE, a lake on the borders of Westmoreland and Lancashire, 10½ miles long from north to south, 1 mile broad, and 240 feet deep, being the largest and most beautiful lake in England. It receives several small streams, and gives off the Leven, which flows into Morecambe Bay. On its eastern shore stands the town of Windermere four miles south-east of Ambleside (situated at the head of the lake). Dove Nest, associated with Mrs. Hemans, and Elleray, the seat of "Christopher North," stand on its north-eastern shore, while Bowness is about midway on the eastern bank. There are numerous small islands.

Windpipe. [TRACHEA.]

Windsor, NEW, a town of Berkshire, England, on the right bank of the Thames, 22 miles W. of London. It includes Eton, on the left bank of the river, with which it is connected by a bridge. Old Windsor, the site of the royal residence in Saxon times, is a village 2 miles to the east. New Windsor is famous for the magnificent castle, founded by the Conqueror, which has since formed the residence of the sovereigns and of which the Duke of Argyll has given, with much grace of style, the standard history in *The Governor's Guide to Windsor Castle*. St. George's Chapel and Wolsey's, or the Memorial Chapel, are beautiful examples of architecture and decorative art. The Home Park contains Frogmore and the Mausoleum of the Prince Consort. The Great Park, with its fine avenue, the Long Walk (at the end of which stands the well-known equestrian statue of George III.), extends to Virginia Water. Windsor has little trade except that arising from the Castle and Eton College, but the markets are well attended. There are barracks for cavalry and infantry, a town hall and masonic hall (both designed by Sir Christopher Wren), the Albert Institute, the Royal Dispensary and the church of St. John the Baptist. Pop. (1901), 13,958.

Windsor, a town of Essex county, Ontario, Canada, on the left bank of the river Detroit, opposite the town of Detroit in the State of Michigan. The leading industries are the manufacture of salt, flour, chemicals, silver ware and bicycles. The town is a residential quarter for many of the merchants of Detroit. Pop. (1901), 13,960.

Windward Islands, a colony belonging to Great Britain, situated between 12° and 14° N. and 61° and 62° W., lying due north of Trinidad and comprising Grenada, the Grenadines, St. Vincent and St. Lucia. They are under a Governor and Commander-in-Chief who resides at St. George's, Grenada. Each island, save the Grenadines (which are partly under St. Vincent and partly under Grenada), has its own institutions, legislature and tariff, but there is a Common Court of Appeal and the islands may otherwise unite for common objects. The chief products are sugar, rum, cocoa, cotton, cotton seed, nutmegs and other spices, arrowroot and timber. Pop. (1905), 180,000.

Wine, the fermented juice of the grape, is a product as old as civilisation. Probably, as a

mere surmise, it may have originated in Asia Minor and spread thence to Greece and Italy, and though still distinctively European, its manufacture has extended to those parts of the New World and the British Colonies in which the grape attains perfection. After the juice has been expressed it is subjected to various natural processes, of which fermentation is the chief, and in due course is ready for the market. Sometimes it is doctored by the addition of extra sugar and fined—that is, freed from albuminous sediment, while the colouring matter and tannin are also diminished—by the use of white of egg, gum, lime, gelatine, etc. The characteristic aroma known as the bouquet proceeds from one of the compound ethers present. If fermentation be allowed to continue till all the sugar is converted into alcohol, a dry wine will result, but if it be arrested before this stage is reached a sweet or fruity wine will be obtained. Wine bottled whilst fermentation still goes on constitutes the effervescent variety. There is reason to believe that the wines of the ancient Greeks and Romans were distinctly inferior to those now made. In France the famous red wines are those of Médoc and Côte d'Or. The sparkling wines from the departments of Marne, Haute-Marne, Aube and Ardennes—collectively known as Champagne and, more familiarly, after the communes of Épernay, Sillery, Reims and Ay—are in universal request, but much of the product sold as champagne has not been within 100 miles of Reims. The white wines of France in greatest esteem are Sauterne, Meursault and Montrachet. Spain is celebrated for its sherry, so called from Jerez de la Frontera, the headquarters of the industry, and the red wines of Tarragona and Rioja. Portugal is noted for its port, named from Oporto, the chief export station. In Italy esteemed wines are those of Chianti, Montepulciano and the Neapolitan brand known as Lacryma Christi. The light Rhine wines of Germany, of which Hock and Moselle are the most celebrated, owe their esteem to their agreeable qualities and the small percentage of alcohol they contain. The wines of Tokay in Hungary, the Marsala of Sicily, and the wines of the Canary Islands are in repute, the first-named frequently commanding exceptional prices. The wines of California, Australia and the Cape are becoming popular and have dislodged the coarser full-bodied vintages. Wine-bibbing as a habit only came into vogue in the United Kingdom after the Commercial Treaty with France, carried out in 1860 by Richard Cobden. Even abstainers allowed that the use of light wine instead of spirits, brandy and old ale was a change for the better, and it cannot be maintained that drunkenness is a national vice in wine-producing countries where it is the customary beverage.

Winkworth, CATHERINE, author and educationist, was born in London on September 13th, 1827, and educated privately at Manchester (where she was under the influence of the Rev. William Gaskell and Dr. James Martineau) and Dresden. During her residence in Saxony she acquired a thorough knowledge of the German language and was completely equipped for the work by which she

is best known. This was a rendering into English of the commoner German hymns under the title of *Lyra Germanica*, the first edition of which was published in 1853. A second series appeared five years later, and in 1862 *The Chorale Book for England*, giving the German hymn-tunes, came out, with the music arranged by Sir William Sterndale Bennett and Otto Goldschmidt. The Winkworths having removed to Bristol in 1862, Catherine devoted herself with conspicuous energy and success to the promotion of the higher education of women. She died at Monnetier, near Geneva, on July 1st, 1878. She was largely instrumental in establishing University College, Bristol, and two scholarships for women were founded at the College in her memory. Her sister, SUSANNA WINKWORTH (1820-84), was also a well-known philanthropist and translator. In the latter capacity she translated Madame Hensler's *Life of Niebuhr* which, however, she virtually transformed into an original work in consequence of the large amount of new matter which she was enabled to incorporate through the assistance of Bunsen.

Winnipeg, capital of the province of Manitoba, Canada, at the confluence of the Red River and Assiniboine, 40 miles S. of Lake Winnipeg and 65 miles N. of the United States boundary. Though almost wholly the creation of the latter half of the 19th century, it contains some of the finest streets in the Dominion. The chief structures comprise the City Hall, Parliament Buildings, the Governor's residence, the University and several educational and charitable institutions. It has immense flour mills and grain-elevators and is the most important distributing centre in the province. Pop. (1901), 42,340.

Winnipeg, LAKE, in Manitoba, Canada, between 50° 30' and 54° N., with a length of 280 and a greatest breadth of 60 miles. It receives the waters of the Saskatchewan, the Red River of the North and the Winnipeg, discharging into Hudson Bay by the Nelson. The shores are low and the water is muddy.

Winona, a town of Minnesota, United States, on the right bank of the Mississippi (here crossed by several bridges), 103 miles S.E. of St. Paul. As the point of concentration of several important railways, it does a large shipping trade chiefly in wheat and other cereals and lumber. The manufactures include agricultural implements and vehicles, flour and malted liquor. It contains Winona Seminary and several other educational establishments. Pop. (1900), 19,714.

Winsford, a town of Cheshire, England, on the Weaver, $\frac{3}{4}$ miles S.W. of Middlewich. The principal buildings comprise Christ Church in the Perpendicular style, the Town Hall, Market Hall and Public Library. The leading industry is the salt manufacture, in which it ranks next in importance to Northwich, and some boat-building is also carried on. Pop. (1901), 10,382.

Winstanley, HENRY, engineer and engraver, was probably born at Saffron Walden, Essex, but in what year is unknown. He emerges into notice

in 1665 as in the service of the Earl of Suffolk, who employed him as clerk of the works at Audley End. When this mansion was sold to Charles II., Winstanley was transferred to the king's service there and at Newmarket. He had meanwhile acquired considerable dexterity as an engraver, and between 1676 and 1688 produced a set of twenty-four plans and views of Audley End. He was also noted for his fantastic designs for buildings and invented and conducted the Water Theatre, a place of entertainment in Piccadilly. He is, however, mainly known as the designer and builder of the first Eddystone lighthouse. The work was begun in 1696 and completed in 1700. The structure was of bizarre design, almost wholly built of wood and quite unsuited for its purpose, as was painfully made evident on the night of November 26th, 1708, when it was swept away. Winstanley, who had gone out to superintend certain repairs, perished at the same time. In 1697, during the building operations, he was seized by a French privateer, but exchanged a few weeks afterwards through the intercession of the Admiralty.

Winston, the capital of Forsyth county, North Carolina, United States, 12 miles from the left bank of the Yadkin. It is contiguous to Salem, the double community being officially styled Winston Salem. It has important manufactures of tobacco and textiles, in addition to those of furniture, waggons, flour and knitted goods. Pop. (1900), 10,008.

Winterhalter, FRANZ XAVIER, painter, was born at Menzenschwand, near St. Blasien, Baden, on April 20th, 1806. He learnt engraving at Freiburg and studied portrait-painting at Munich under Joseph Karl Stieler, supporting himself meanwhile by lithography, for which he had undoubted aptitude. His portrait of Leopold, Grand Duke of Baden, painted in 1822, achieved so much success that he was appointed painter to the Court, and soon afterwards received commissions to paint many of the crowned heads of Europe and other distinguished persons. His vogue as a fashionable portrait-painter was as well established as that of Sir Thomas Lawrence, to whom he was, nevertheless, inferior. Amongst the most celebrated of his portraits were those of Queen Victoria and her family, the Prince Consort (now in the National Portrait Gallery, London), Louis Philippe, Queen Amélie (an excellent example of his "showiness," now in Versailles), Napoleon III., the Empress Eugénie, Francis Joseph, Prince Metternich and King Leopold. He died at Frankfort on July 8th, 1873. He possessed the knack of catching a likeness, could compose effectively and was clever in rendering the elegance and suggesting the distinction of his sitters; but his work wholly lacked all the higher qualities of craftsmanship.

Winterthur, a town in the canton of Zürich, Switzerland, 13 miles N.E. of Zürich city. It is a thriving industrial centre, the manufactures including cotton, silk, cambric and other fabrics, machinery and wine. The chief buildings are the town hall and picture gallery, besides several educational

institutions. Ober-Winterthur, one mile to the north-east, is the site of the Roman settlement of Vitodurum. It was one of the comparatively few places that evinced strongly-marked loyalty to the House of Hapsburg. After the fall of Duke Frederick of Austria it became for a period a Free Imperial city (1415-42); but when the Swiss Confederates reduced Thurgau, Winterthur was besieged for nine weeks and was ultimately isolated in the midst of a people bitterly anti-Austrian in their sentiments. It was then sold by the Duke to the city of Zürich (1467), which has periodically but in vain endeavoured to crush its rival industries. Pop. (1900), 22,335.

Wire is made by drawing a bar of metal through a tapering hole in a plate of steel, called a draw-plate, and may be reduced to almost any required size by being drawn through other holes of successively smaller diameter. Metals are greatly hardened by this process, so that frequent annealing is required. Ruby or agate bushes, pierced with holes of the required size, are used for making fine wires of gold, platinum, etc. Wire may be made of round, square, or other section by making the holes in the draw-plate of corresponding shape. The diameter of round wire is most conveniently measured in thousandths of an inch (mils), or in millimetres, but for commercial purposes the Imperial Standard Wire-gauge is used, which ranges from No. 7, which is 0.5 in diameter, to No. 50, 0.001 in diameter. This has superseded the Birmingham gauge, which was not a trustworthy standard, as the diameter corresponding to any given number was not an invariable quantity.

Wireless Telegraphy. That certain substances termed conductors permitted the electric current to pass through them with more or less ease was observed as early as 1740, but it was not until 1837 that Professor Morse in the United States and Sir W. F. Cooke and Sir Charles Wheatstone in England showed how the phenomenon might be practically applied. To them the invention of the electric telegraph may be credited. The apparatus by which signals are transmitted over a wire consists, at the sending station, of an electric battery connected to a Morse key, with the Morse key connected to the conducting wire. At the receiving station the terminus of the conducting wire is connected to a sounder or recording instrument by which the signals are registered. By depressing the Morse key at the sending station the operator effects a contact between the battery and the conducting wire, and the signal, with inconceivable rapidity, flashes along the wire to the receiving station. The signal code has been named after Professor Morse, the characters of the alphabet being represented by combinations of dots and dashes, A being a dot and a dash, B a dash and three dots, and so on, the dot being a short snappy depression of the key, while the dash is a touch longer sustained. To dispense entirely with the conducting wire has been the aim of many eminent scientists, all of whom by invention and improvement have contributed in some measure to the

development of the several systems before the public. Every system, however, appears to be capable of further improvement before it can come into extensive commercial use, none of them having yet attained that certainty of transmission that obtains with a conducting wire. In 1838 Professor Steinheil found that the earth itself was a conductor of electricity, and after a series of experiments he succeeded in signalling without a wire to what may now appear the insignificant distance of 80 feet. The employment of the earth as the conductor of the current, however, presented so many practical difficulties that further investigations were not proceeded with, and on the discovery of Professor Morse in 1844 that electricity might be made to cross a river, experiments were diverted into that direction. The method proposed by him engaged the attention of many experimenters for some years, and their efforts were rewarded with no mean success. Notably amongst these was James Lindsay, who signalled in 1860 across the Firth of Tay where it is more than a mile wide. Following in his steps Sir William Preece telegraphed across the Solent and later in 1886 across the estuary of the Severn, where it is over four miles in width. Their method was to carry along one bank of the river a wire furnished at each end with a large

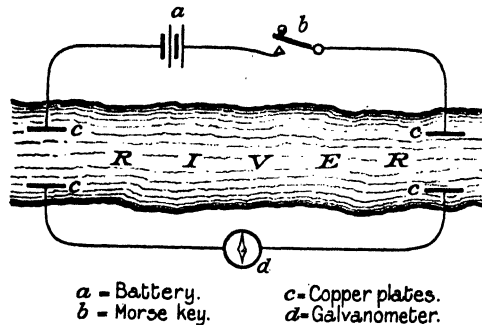
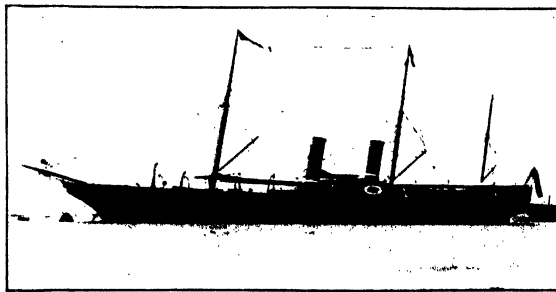


FIG. 1.

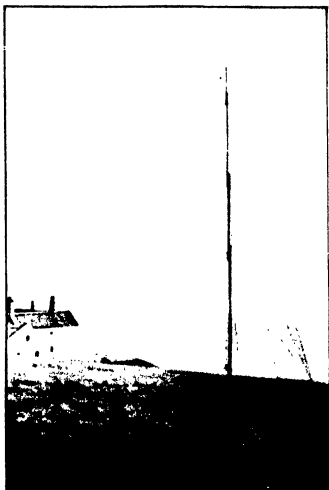
copper plate, and on the other bank another wire similarly fitted. The copper plates were submerged and a current sent along one wire was found to be conducted by the water across the river, and could be detected in the wire opposite, the intensity of the current in the receiving wire being proportionate to the size of the copper plates and the width of the river (Fig. 1).

Promising, however, as the results were, researches were turned into another channel by the overshadowing discovery of electric magnetic waves by Hertz. The Hertzian waves, as they are called, are now the basis of all modern systems of wireless telegraphy. It is to be noted here that the phenomena of sound and light are but expressions of wave motion, the former of vibrations in the air and the latter of vibrations in the ether. The highest note that can be detected by the human ear has vibrations of about 40,000 per second, while the lowest visible rays of the spectrum have vibrations



A. F. Barker, Varen, phot.

The Royal Yacht, *Osborne*, fitted for Experiments in Wireless Telegraphy.

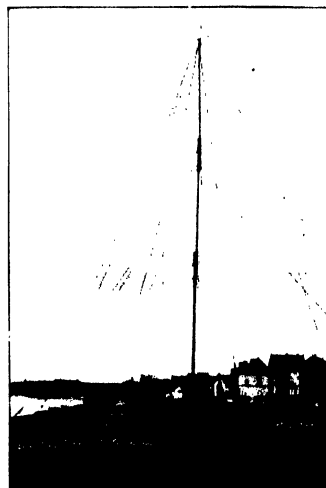


George Spicer, Dover, phot.

The South Foreland Station,

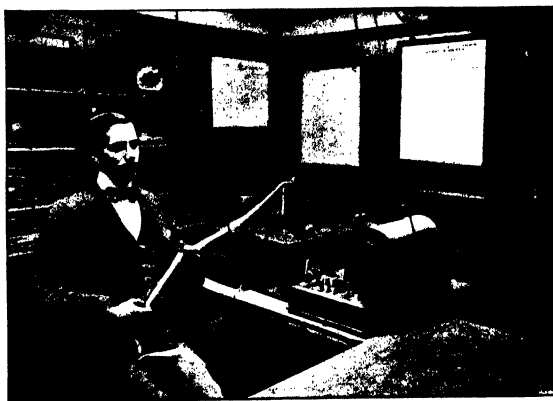


Eastwood, New York, phot.
GUGLIELMO MARCONI.



A. Lornier, Boulogne, phot.

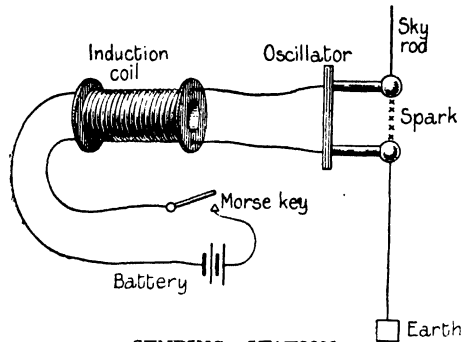
The Mast on the Shore at Wimereux, near Boulogne.



Lambert Weston & Son, Dover, phot.

Mr. Marconi and his Instruments.

of about 400 billions per second. Into the wide gap that separates the sense of sound from the sense of sight, the Hertzian waves fall with a vibratory number of 230 million per second. They are too rapid to be heard and too slow to be seen,



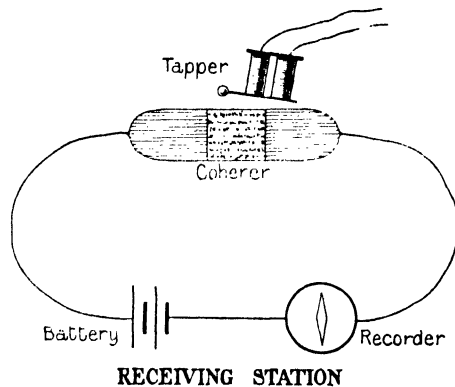
SENDING STATION

FIG. 2.

yet although inaudible and invisible, their existence is not difficult to demonstrate. We know exactly their wave length, or their distance from crest to crest, their amplitude, or their height from trough to crest, their period, or the number of wave lengths they travel in a second and more, and we can by suitable means reflect and deflect them or modify their wave length to anything between a foot and a thousand miles. Professor Bose, of Calcutta, has produced vibrations of only a quarter of an inch wave length, but in actual practice waves are used between 1,000 and 3,000 feet in length. Hertz died in 1894 without having had the opportunity of seeing his work carried to practical fulfilment. His brilliant researches, however, laid the foundation for applications of the greatest importance. To Marconi we are indebted for having brought wireless telegraphy outside the sphere of laboratory experiment. He came to England in 1896, at the early age of twenty-two, to apply for his first patent. Having studied at Bologna University under Professor Righi, an enthusiastic follower of Hertz, Marconi received the training that enabled him to effect one of the greatest achievements of modern times in applied science. The general principle of the Marconi system is that, at the sending station, the electric current is furnished through an induction coil, a device for transforming powerful currents of low voltage into weak currents of high electromotive force. In signalling over long distances where great energy is needed, generators up to 100 horse power are required. A Morse key connects the induction coil or other source of energy with what is called an oscillator (Fig. 2). The oscillator is similar in function to a Leyden jar in that metal balls are charged with the electric current and a spark passes between them. On depressing the Morse key the source of energy is brought into action, and the spark, accompanied by a more or less violent explosion, indicates that the electromagnetic waves have departed on

their signalling mission. The waves are thrown off in every direction, like the waves that follow the throwing of a stone into a pond. At the receiving station the arriving energy is so feeble that an instrument of more than ordinary delicacy is needed to detect it. Hertz devised what he termed a resonator, really a simple form of oscillator, but it was found quite useless for anything beyond short distances. Sir Oliver Lodge then observed that a tube containing metallic filings diminished its resistance on the passage of the electric current and called the device a "coherer." Many forms of coherer have since been invented, the one used by Marconi being a small glass tube fitted with two silver plugs. The plugs are separated by a small space which is filled with a mixture of nickel and silver filings. On the impact of the electric waves the coherer becomes converted into a conductor, the filings clinging together and by their cohesion forming a bridge for the passage of a current from an adjacent battery. The latter current then transmits the signal to the recording instrument. Simultaneously a "tapper" is actuated which falls upon the glass tube for a moment, decohering or shaking back the filings to their original freedom and ready to be affected by subsequent waves (Fig. 3).

It has been found that the apparatus is more effective if the oscillator at the sending station and the coherer at the receiving are connected to a high vertical wire. The height to which this wire is carried seems to have an important influence over the distance to which signals may be transmitted. By the adoption of these "antennae" Marconi was enabled to send his first wireless message across the Atlantic on December 22nd, 1902. Many important modifications in his apparatus have since



RECEIVING STATION

FIG. 3.

been made, and there can be no doubt that wireless telegraphy has a great future. It is remarkable that daylight exerts a serious retarding influence upon the electric waves. Marconi observed that signals were quite imperceptible after sunrise beyond 800 miles, while at night time they were clearly decipherable up to 2,000 miles. The

difficulty, however, is said to be overcome by the employment of greater energy at the sending station in the daytime. A very manifest objection to wireless telegraphy at present is its alleged want of secrecy. This can of course be obviated in some measure by the use of a code, but nevertheless the direction of radiation of the waves cannot be completely controlled. They are dissipated in every direction from the sending station, and the possibility of the interception of messages is therefore apparent. Marconi messages to and from Poldhu in Cornwall are read on the instruments the Post Office station at Penzance and also at Porthcurno. Attempts have been made to avoid this by a system of tuning or "syntony." If a C tuning-fork be struck in a room, the C note on the piano will respond, and although the vibration of the tuning-fork may be stopped the note on the piano will continue. The reason of this is that the length of the sound wave given off by the tuning-fork is exactly the same as that of which the piano-string is capable. On the same principle it is imagined that the electric waves may be so regulated in wave length that they will correspond only with the receiving station for which the message is destined. A perfect system of syntony, however, has yet to be found, although several inventors have made the claim. Wireless telegraphy is also subject to serious interference from atmospheric conditions and disturbances.

Of other systems than the Marconi there are the Lodge-Muirhead, the Fessenden, the De Forrest, the Telefunken and others, each with rival claims to notice. The Lodge-Muirhead dispenses with the antennae or sky-rods; the type of emitted radiations is different from those used by Marconi; the coherer has no tapper, being self-decohering, and the system is altogether trustworthy, syntony being the aim of the inventors rather than to cover great distances. The system of Dr. Lee de Forrest has the feature that no coherer is used at the receiving station, being replaced by a device called a responder. This is probably the most sensitive detector of the Hertzian waves at present in use. Its principle is electrolytic and signals may be clearly heard in a telephone receiver. The system was successfully used by *The Times* newspaper in the Russo-Japanese war, and has found favour in the United States in both the army and the navy. The receiver of Professor Fessenden is also in principle electrolytic. The power required for the transmission of signals is much less than in other systems, and messages may be sent at a high rate of speed with great accuracy and an almost complete immunity from atmospheric interference. The Telefunken is a formidable competitor to the Marconi. The word means "spark telegraphy," and is the product of the fusion of the systems known as the Braun-Siemens and the Slaby Arco. Instead of the single wire antennae of Marconi, the sending station of the Telefunken has a fan-shaped arrangement of wires stretched between two vertical poles, the area of the net being proportionate to the distance to be traversed, the energy radiated being greater as the size of the net increases. The Telefunken also, unlike the Marconi and like the

Lodge-Muirhead, has no direct connection to earth. It is well adapted for use in the field and at sea, installations having been fitted for nearly all the navies of the world, Italy and Great Britain excepted, both countries being committed to the Marconi system. The applications of a perfect system of telegraphy without a conducting wire are almost without limit, and the advent of such at a reasonable cost of installation would mark an epoch in the history of mankind. The word "marconigram" has come into use to express a message despatched or received by wireless telegraphy.

Wire-Worms, the larvæ of certain beetles belonging to the family known as the Elateridæ. They survive for several years, and do serious damage to crops. *Elater lineata* is a well-known British species.

Wisbech, or WISBEACH, a town of Cambridgeshire, England, in the Isle of Ely, on the river Nen, 22 miles N.E. of Peterborough. The Nen communicates with the Ouse (from which the town is said to take its name = Wyse) by means of the Wisbech Canal. Facilities for navigation have been improved to such a degree that vessels of nearly 800 tons can discharge near the town. The Romans built a fort here and it was a place of some importance at the time of Wulfhere, the Mercian King (d. 675). After William the Conqueror had subdued the Isle of Ely, he erected a castle at Wisbech to dominate the locality. The town and the castle suffered severely from inundation in 1236. The fortress remained in a ruinous condition till the 15th century when John Morton (1420-1500), Bishop of Ely and afterwards Archbishop of Canterbury, had a palace built for an episcopal residence. This was employed in Queen Elizabeth's reign as a State prison, Robert Catesby (1573-1605) among others being incarcerated here, and was afterwards purchased by John Thurloe (1616-68), Cromwell's Secretary of State and M.P. for Ely, who erected a new mansion from Inigo Jones's designs. After the Restoration the building reverted to the Bishops of Ely, by whom it was sold in 1793 and all traces of it have now disappeared. Edward VI. incorporated Wisbech in 1549, his charter being renewed by James I. in 1611 and confirmed by Charles II. in 1669. The principal structures are the church of St. Peter and St. Paul, remarkable for its double naves, aisles and chancels, the Corn Exchange, Public Hall, Custom House, Cattle Market, Museum, Literary Institute, Cambridgeshire Hospital and Grammar School, founded in the reign of Edward VI. There is a monument to Thomas Clarkson (1760-1846), one of the leaders of the crusade against slavery, who was a native of the town. The industries include the making of agricultural implements, roperies, brewing, coach-building, planing and saw-mills, corn and oil-cake mills, and an enormous quantity of fruit and vegetables is grown for the London and other markets. The exports largely comprise coal and agricultural produce and a brisk trade is carried on with the ports of North Europe. Several horse and cattle fairs are held in summer. Pop. (1901), 9,831.

Wisby, or VISBY (Old Norse, *re*, "sanctuary"; *by*, "town"), the capital of the Swedish isle of Gothland in the Baltic, on the west coast, 115 miles S.S.E. of Stockholm. In the Middle Ages it was a Hanseatic port and the centre of a large trade, and gave its name to an important code of marine laws. Merchants flocked to it from different parts of Europe and many of them built churches, several of which are beautiful in their decay. It was so prosperous that its folk were said to play with jewels, its swine to feed out of silver troughs, and its old women to spin with distaffs of gold. His cupidity aroused by this vast wealth, Waldemar III. plundered it in 1361 and the port never recovered from this disaster. For nearly 170 years the place became the resort of pirates, who harried the Baltic ships and at length made themselves such a nuisance that they were suppressed and the town partially burned. It then was annexed to Denmark, but in 1645 was restored to Sweden by the Peace of Brömsebro. The turreted walls still stand, but much of the enclosed space, no longer occupied by streets, has been converted into quaint old gardens, some of which form a picturesque setting to the ruinous churches. Of these the most interesting, that of St. Nicholas, is partly Romanesque, partly Gothic, while St. Mary's, the cathedral, dating from the 12th century, is the only one which is now used. There is a collection of antiquities in the museum. Pop. (1900), 8,376.

Wisconsin, a North Central State of the American Union, bounded on the N. by Lake Superior, on the E. by Michigan and Lake Michigan, on the S. by Illinois and on the W. by Minnesota and Iowa, the Mississippi being a natural boundary on this side. It occupies an area of 56,040 square miles. The river from which it takes its name flows through it to the west and joins the Mississippi after a course of 270 miles. Other important rivers are the Black, Chippewa, Bois Brulé, St. Louis, Milwaukee, Fox and Menomonee. Lakes abound, Winnebago, Green, Geneva, Koshkonong and St. Croix being the largest. The surface is undulating, and the soil fertile. Oats, maize, wheat, barley, rye, potatoes, maple sugar, apples, hops, hemp, flax and tobacco form the staple products. There are valuable forests in the north and extensive prairies in the south. Cattle, sheep, horses and swine are raised in vast numbers. Lead, iron, copper, zinc and silver are among the mineral resources. The industries include brewing, lumbering, milling, tanning, engineering, textiles, paper-making, meat-packing, and the making of vehicles and agricultural implements. Madison (19,164) is the capital and Milwaukee the principal commercial town. The State is noted for its examples of the mounds reared by prehistoric man. In 1836 it was constituted a Territory and entered the Union in 1848. Pop. (1900), 2,069,042.

Wiseman, NICHOLAS PATRICK STEPHEN, Cardinal-archbishop, was born at Seville, Spain, of Irish parents, on August 2nd, 1802, and educated at Waterford in Ireland, St. Cuthbert's College at Ushaw, near Durham, and the English College in

Rome. He greatly distinguished himself in theology, Hebrew, Syriac and other languages and was ordained a priest in 1825. In 1828 appeared his *Horæ Syriacæ*, which established his reputation as an Orientalist, and in the same year he was appointed Rector of the English College, a post he occupied for twelve years. His lectures *On the Connection between Science and Revealed Religion* were published in 1835, and in the following year he was instrumental, along with Daniel O'Connell and Michael Joseph Quin, in starting the *Dublin Review*, a Catholic quarterly. In 1840 he became President of Oscott College, and soon after Pius IX.'s pontificate began was engaged at Rome in delicate business connected with a reform of the Papal government. In 1848 he returned to England as the Pope's diplomatic envoy to Lord Palmerston, and in 1849 succeeded Dr. Walsh as Vicar-Apostolic. In 1850 he was created Cardinal and also, on the restoration of the Catholic hierarchy in England, Archbishop of Westminster. The Pope's progressive policy aroused widespread anger in the United Kingdom, and it was some time before Wiseman's shrewd and conciliatory disposition calmed the tempest. He relieved his arduous labours by occasional excursions into the field of lighter literature, his story (1854) of *Fabiola, or the Church of the Catacombs*, attaining to great popularity in Italy, and being translated into several tongues. He died in London on February 15th, 1865, and was buried at Kensal Green amidst unusual demonstrations of public mourning. The Catholic Cathedral at Westminster was raised to his memory, and the street in Seville in which he was born was re-named, after his death, Calle del Cardenal Wiseman. He was the "Bishop Blougram" of Robert Browning's *Bishop Blougram's Apology*, but the poet's unfavourable interpretation of his character has been called in question.

Wishart, GEORGE, Reformer, was born probably at Pittarrow, near Montrose, Scotland, about 1513, and was educated at King's College, Aberdeen. In early life he is believed to have been a schoolmaster at Montrose, but in 1539 is found lecturing in Bristol, where being accused of heresy he recanted. After spending three years on the Continent he passed a few months at Cambridge, where he became a member of Corpus Christi College (1543). He then returned to Scotland and devoted the rest of his life to preaching in the south and east and to ministering to the poor and ailing, rendering remarkable service in Dundee during the visitation of the plague in 1545. His zeal in proclaiming the Reformed doctrine provoked the wrath of Cardinal Beaton who had him arrested on a charge of heresy. After trial he was burned at the stake in St. Andrews on March 1st, 1546. He was a man of noble and self-denying character.

Wishaw, a town of Lanarkshire, Scotland, 15 miles E.S.E. of Glasgow. It dates from 1794, when it was laid out on the south-western slope of a hill, two miles from the right bank of the Clyde and half a mile south of South Calder Water, and now includes not only Wishaw proper but the villages of Cambusnethan and Craignek. It has

large and important collieries and iron and steel works, blast furnaces, iron foundries, railway wagon factories, fire-clay works and distilling. Pop. (1901), 20,863.

Wismar, a seaport of Mecklenburg-Schwerin, Germany, at the head of a bay on the Baltic, 18 miles N.E. of Schwerin. The principal buildings are the churches of St. Mary, St. George, and St. Nicholas, of the 14th and 15th centuries, the town hall, containing a picture gallery, the Renaissance ducal palace, now a district court, the Alte Schule, with a collection of antiquities, the guard house of the 15th century, the archdeaconry, the industrial school, and the school of navigation. It has manufactures of machinery, asphalt, sugar and chicory, besides fisheries, iron-founding and brewing. Wismar was a prosperous member of the Hanseatic League, and from 1648 to 1803 was a Swedish possession. Pop. (1905), 21,902.

Wissembourg (German, WEISSENBURG), a town of Lower Alsace, Germany, on the right bank of the Lauter, 34 miles N.E. of Strasburg. The principal buildings are the mediæval church of St. Peter and St. Paul, and the antiquarian museum. The town grew up around a Benedictine abbey of the 7th century, and in 1305 was made a free imperial city. It has manufactures of paper, matches and wine, and fruit is largely cultivated in the vicinity. In October, 1793, the Allies under Wurmser stormed the Wissembourg Lines, which Pichegru afterwards compelled them to abandon. On the 4th of August, 1870, the Crown Prince of Prussia, afterwards the Emperor Frederick, signally defeated General Douay in the first great engagement of the Franco-German war. For nearly 170 years before that date the town had belonged to France. Pop. (1900), 6,946.

Wistaria, or, more correctly, *Kraunhia*, named after Caspar Wistar of Philadelphia (1761-1818), is a genus of climbing leguminous shrubs with pinnate leaves and profuse pendulous racemes of lilac flowers, natives of North China, Japan and North America. *Wistaria chinensis* is the species commonly grown on walls in England.

Wit. The Middle-English word wit refers to the intellectual powers collectively, and from its relation to the Saxon *witan*, to know, and *wis*, wise, we have its primary signification, namely knowledge and wisdom. Few words of the English language have departed farther from their original meaning than the word "wit." We no longer conceive the man of wit as of necessity a man of knowledge and wisdom, although wit may be a form or direction of genius, in which sense it is sometimes used by Dryden and Pope. In the time of Elizabeth it was generally employed in its original sense of intellectual power, and was so subject to qualifications, as "a pregnant wit," or "a pretty wit." Shakespeare, however, disregards wit as the function of the collective faculties of the mind, and assigns it to several faculties: thus, "They never meet but there's a skirmish of wit between them. Alas, in our last conflict four of his five wits went halting off, and now is the whole man govern'd by one."

Dryden, too, distinguishes wit from general mental power when he says, "For wit and power their last endeavours bend, 'T'outshine each other."

It is the special function of wit to discover congruities amongst ideas that, apparently, are wholly dissimilar. But this is not all. It must be poignant, and have the air of spontaneity, and please the fancy, and afford surprise, and, as De Quincey says, be "punctually concentrated within the circle of a few words." In this sense Lord Macaulay declares that the greatest of all wits was Sir Francis Bacon. Sydney Smith displayed wit when he said, in effect, that the chances of pleasing a tortoise by stroking its shell, would be about equal to those of pleasing the Dean and Chapter by stroking the dome of St. Paul's. John Locke, whilst adopting the description of wit as discovering resemblances in incongruous ideas, points out that it must not be confounded with judgment, whose function is to separate ideas in which the least difference can be found "thereby to avoid being misled by similitude, and by affinity to take one thing for another." This distinction is recognised by Shakespeare in Henry VIII.: "The king your father was reputed for a prince most prudent, of an excellent and unmatched wit and judgment."

Ben Jonson, however, seems to confound the two ideas, for he speaks of "the chair of wit," as though wit were equivalent to judgment, or, generally, to the discriminating function of good sense. The epigrammatic character of wit, which as Lander says "vibrates and spirts," is perceived by Shakespeare in the lines: "A College of wit-crackers cannot flout me out of my humours: dost thou think I care for a satire, or an epigram?"

It is not essential to wit that it should provoke mirth. It is an intellectual feat with assignable logical limitations, and although its ingenuity may please the fancy, its exercise reacts upon different kinds of emotions and feelings. Wit bordering on satire may be unkind: as L'Estrange says, "Intemperate wits will spare neither friend nor foe, and make themselves the common enemy of mankind." So, too, Robert South: "Lewd shallow hair-brain'd huffs, make atheism and contempt of religion, the only badge and character of wit."

Far from the original use of the word, wit is often employed to express stratagem, or power of expedients—mere cunning, in the popular sense: thus we find Milton writing "Sleights from his wit and subtlety proceed"; and Shakespeare has this passage, "I was like to be apprehended for the witch of Brainford but that my admirable dexterity of wit, counterfeiting the action of an old woman, delivered me." So, too, wit in the plural loses the power of its original meaning and refers simply to the proper normal balance of the faculties: as we find in *Romeo and Juliet*: "If our wits run the wild goose-chase, I have done: for thou hast more of the wild goose in one of thy wits, than I have in my whole five." And, again, Shakespeare asks, "Are his wits safe? Is he not light of brain?"

Dryden refers only to the trappings of wit when he defines it as "thoughts and words elegantly adapted to the subject," but he perceives its true character when he says that "true wit

is such an assemblage of ideas that gives delight and surprise to the reader," the delight being the feeling afforded by the skill displayed in the selection and application of the ideas discovered—not necessarily by the matter, which may provoke pain; and in order that the reader may enjoy the exhilarating feeling of surprise, the resemblances discovered in apparently incongruous ideas must not be obvious. As an illustration Dryden says, that, "when a poet tells us that the bosom of his mistress is as white as snow, there is no wit in the comparison; but when he adds, with a sigh, it is as cold too, it then grows into wit."

Thus it would appear that wit is allied to metaphor and simile, and by this nature is related in its highest sphere to the poet, and in its lowest to the punster. We must be careful, however, not to confound wit with humour. Whilst it is the part of wit to discover similarities in apparently dissimilar ideas, it is that of humour (as Serjeant Cox pointed out) to bring to light incongruities in ideas that appear to be wholly congruous. Wit excites admiration, humour mirth. Wit is quick, direct, combining, and may be unkind; humour flows slowly, is diffusive and genial. The appreciation of both wit and humour is not always found in the same person, hence they cannot be regarded as functions of the same faculty. True wit is a product of mental culture; whereas humour is found in its absence, and may be considered as a sort of instinct.

The appreciation of wit implies reflection, and is explicable; not so the enjoyment of humour which is spontaneous, and often inexplicable. That wit does not necessarily produce mirth is understood when we remember it has to do with congruities—that is, it makes for order; but humour is concerned with incongruities, and the incongruous is disorderly, suggesting the ridiculous—which is the laughter-exciting element.

Wit, again, is a purely intellectual activity, whilst humour through its direct appeal to the emotions is exposed to all the influences of the moral nature, and therefore may be, as Henry Reed says in his *Lectures on English Literature*, "co-existent often with the gentlest and deepest pathos." The better to understand the difference between wit and humour we should read the works of the recognised wits and humorists with the view of analysing the nature of the ideas and feelings in us which each author respectively excites. Should that nature be emotional, it has been appealed to by humour; if intellectual, by wit.

Witchcraft, a particular form of magic, with a very wide range in time and space. E. B. Tylor says that "witchcraft is part and parcel of savage life. There are rude races of Australia and South America whose intense belief in it has led them to declare that if men were never bewitched, and never killed by violence, they would not die at all." The idea of witchcraft that grew up in the Christian Church included an actual compact with the Devil, and this lasted down to modern times, though it has perhaps faded out of the notion of such witchcraft as lingers—and a good

deal does linger—amongst us. In the 10th century we have the first account by a Christian writer of the witches' sabbaths—meetings at which the Devil was supposed to preside and receive the homage of the witches, with rites that cannot be named. Next came the notion that the witches rode through the air to these meetings on goats and other animals, and in 1310 a council held at Trèves denounced this as a delusion. Then the Inquisition took the matter up, and trials and executions for witchcraft became numerous, the only evidence being in most cases confessions wrung from the accused by torture or the outcome of diseased imagination. The strong measures taken against witches went on without check till the middle of the 16th century. In the middle of the century the work of Wierus, a German physician, did much to throw doubt on the reality of witchcraft, and towards its close Reginald Scot's *Discoverie of Witchcraft* had a similar effect. The *Demonologie* of King James (1597) supported the other side of the question. The Jesuit Spee (1631), though not directly attacking the belief, showed that many innocent persons had been put to death on that charge, and so produced a feeling in favour of greater caution in the proceedings. In England the witchmania reached its height under the Protectorate. Scotland has an unhappy notoriety in this matter, as may be seen from Sir Walter Scott's *Letters on Demonology and Witchcraft*; and New England was as guilty as Europe in witch-baiting. The last person tried for witchcraft was convicted in 1712, but the sentence was not carried out. In 1727 a woman was burnt in Scotland on a charge of attending a witches' sabbath, riding thither on her own daughter, whom the Devil had changed into a pony for that purpose. In 1726 prosecutions for witchcraft were abolished in Great Britain, but so-called witches were burnt on the Continent as late as 1793, and in 1860 one was burnt in Mexico.

Witenagemot, or Council of Wise Men, denoted among the Anglo-Saxons a meeting of the nobles, chiefs, large landholders and chief ecclesiastics, and in the later days of Saxon rule it was the great council of the nation, which had for its counterpart under the Norman dynasty the council which became the germ of the English House of Lords. The functions of the Witenagemot were to elect and depose rulers, to make laws and treaties, and to regulate ecclesiastical affairs and revenues in matters temporal.

Wither, GEORGE, poet, was born at Bentworth, near Alton, Hampshire, on June 11th, 1588, educated privately and at Magdalen College, Oxford, and called to the bar in 1615. But law had fewer charms than poetry and he began to publish early, his first books being *Prince Henries Obsequies* (1612), *Epithalamia* (1613), in celebration of the marriage of the Princess Elizabeth to the Elector Palatine, and *Abuses Stript and Whipt* (1613), a satire that led to his incarceration in Marshalsea prison, from which he was delivered after a few months on the intercession of the Princess Elizabeth. To an early edition of *Fidelia* (first published in 1617) belongs the immortal lyric "Shall

"I wasting in despair?" This was followed by *Wither's Motto* (1621), which landed him again in the Marshalsea. *Faire Virtue, the Mistress of Philarete* (1622), is the last of his greater works, though he was seen to advantage in *Hallelujah* (1641), a collection of hymns, spiritual songs and moral odes. A Puritan, he sided with Parliament in the Civil War and supported Cromwell with his pen. At the Restoration he was committed to Newgate, but released after a year's imprisonment. He died in London on May 2nd, 1667.

Witness. [OATHS.]

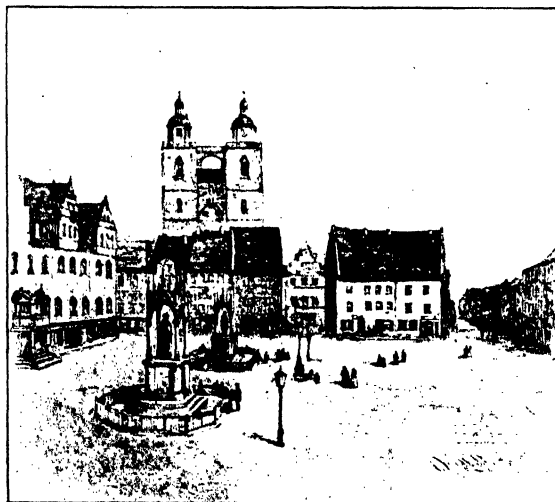
Witney, a town of Oxfordshire, England, on the Windrush, 11 miles W. by N. of Oxford. The church of St. Mary, restored in 1867, exhibits work in different styles from the Early English to the Late Perpendicular, with some remains of Norman. The church, probably a still earlier one, appears to have belonged to the see of Winchester, the bishops of which had for a considerable period a summer palace in the grounds to the east of the chancel. Other prominent buildings are the Town Hall, an old rectangular structure supported on stone columns; the Corn Exchange, containing rooms occupied by the Athenaeum and the Natural History Society, the Grammar School, founded by Henry Box in 1662, and the Blue Coat School, dating from 1723. In the market-place stands the Butter Cross, a wooden structure erected in 1683, supported on pillars, the basement of which was once utilised for the sale of dairy produce. Several fairs and markets for cattle, horses, pigs and cheese are held during the year. The manufacture of blankets is the principal industry, and is a speciality, but brewing and the making of woollen goods and gloves are also carried on. From 1312 to 1360 Witney returned two members to Parliament, when the inhabitants petitioned to be relieved of the privilege. Pop. (1901), 3,574.

Wittenberg, a town of Saxony, Prussia, on the Elbe, 57 miles S.W. of Berlin. It was the birthplace of the Reformation. Martin Luther nailed his theses to the door of its Schloss-Kirche on October 31st, 1517, and was buried in the church, where also Philip Melancthon lies. The University, founded in 1502, in which Luther taught and Hamlet studied (against his mother's wish), was incorporated with the University of Halle in 1815. The houses of Luther (in the Augusteum), Melancthon and Lucas Cranach, the painter, are still preserved. In the Stadt-Kirche Luther often preached. The manufactures include machinery, textiles, hosiery, spirits and leather, besides iron-founding, flour-milling, brewing and brick-making. Pop. (1900), 18,340.

Wood (*Isatis tinctoria*), a biennial Cruciferous plant, probably a native of South-Eastern Europe, was cultivated all over Europe for the blue dye obtained from it, until superseded by indigo. Its general use is mentioned by Dioscorides and

Pliny; and the name "Briton" is said to be derived from the Celtic *brit*, "painted," with reference to the use of this plant by the natives at the time of Cæsar's invasion.

Woburn, a town of Bedfordshire, England, 15 miles S.W. of Bedford. In the 16th and 17th centuries it underwent several disasters. It was almost burned down in 1595, was visited by the plague in 1625 and in 1642 was partly destroyed by fire by the Cavalier troops in revenge for the support which the inhabitants had given to the Parliamentary party. The old church of St. Mary the Virgin erected by Richard Hobbs, the last Abbot of Woburn, was demolished in 1868 and a mortuary chapel built on its site out of the materials, but the tower is still intact. A handsome new church was erected near the entrance to the park in the same year. The chief public buildings are the Town Hall and the Institute. The main industry is the making of lace and straw-plaits, though it is not so prosperous as formerly. Woburn Abbey, the seat of the Duke of Bedford, is connected only in name with the conventual institution founded for Cistercian monks in 1145 and surrendered in 1535. The last Abbot, already referred to, having thrown off his allegiance to Henry VIII. and joined the rebels in Lincolnshire and Yorkshire, was ultimately captured and hanged on an oak (said to be still standing) in front of the building over which he had presided. The site and grounds of the abbey were granted to John, Lord Russell of Chenies, in 1547, and amongst sovereigns enter-



THE MARKET SQUARE, WITTENBERG.

tained there were Queen Elizabeth and Charles I. The existing mansion, in the Italian style, dates from 1744 and is noted for its art treasures. Sir Edwin Landseer was a frequent guest and painted nearly every member of the Russell family,

as well as such subject pictures as "Chevy Chase." Curiously enough, a much finer picture by the same artist, "The Departure of the Highland Drovers," was a commission from the Duke of Bedford, but his Grace did not care for it when finished and relinquished his claim to it to John Sheepshanks, who bequeathed the painting to the English nation and it now hangs in the Victoria and Albert Museum, South Kensington. Pop. (1901), 1,129.

Woffington, MARGARET, usually styled "PEG," actress, daughter of a journeyman bricklayer, was born in Dublin on October 18th, 1718



MARGARET WOFFINGTON.

(From the mezzotint by J. Faber, after E. Haytley.)

(though, possibly, four years before). While a mere child she became habituated to playing in booths, but her talents gradually asserting themselves she ultimately won a more than local reputation. In April 1740 her acting of "Sir Harry Wildair" in the *Constant Couple* (in which she remained incomparable to the end) created such a *furor* that she was engaged for Covent Garden, London, where she appeared in November of the same year and where her success was instantaneous. On September 8th, 1741, she made her *début* at Drury Lane, with which theatre she was associated for several years, partly in consequence of David Garrick's unrequited passion for her, but returned to Covent Garden in 1749 after Garrick's marriage. She continued to hold her own against

all rivals till the close of her short life. Though she did not die actually in harness, her health gave way whilst acting "Rosalind" in *As You Like It*, on May 3rd, 1757, and she never appeared on the stage again, dying in Westminster on March 28th, 1760. She was seen to exceptional advantage in the rôle of the lady of fashion and in breeches parts she reigned supreme. Her reputation stood high in tragedy, in which "Andromache" and "Calista" were her most popular performances, but though she sustained many of Shakespeare's heroines none of her renderings became traditional. She had a fiery temper, once stabbing Mrs. Bellamy almost in sight of the audience.

Woking, a town of Surrey, England, on the Wey, 6 miles N. of Guildford. Owing to its dry soil and agreeable surroundings it is a favourite residential quarter, with a fine golf course and large nursery gardens. The Convict Prison for Women and Invalids, the County Lunatic Asylum and the London Necropolis are situated within the parish, while Bisley, whither the National Rifle Association transferred its annual meeting from Wimbledon in 1890, is in the vicinity. Pop. (1901), 16,222.

Wokingham, a town of Berkshire, England, within the ancient confines of Windsor Forest, 7 miles S.E. of Reading. The principal buildings are the churches of All Saints in Early English, St. Paul in the Decorated, and St. Sebastian in Early English, the town hall and market house, and the Victoria Almshouses erected in 1887 to commemorate the Queen's Jubilee. There are paper, saw and flour mills. Dr. Thomas Godwin, Bishop of Bath and Wells, was born here in 1517 and died here in 1590. John Gay, Dr. Arbuthnot, Alexander Pope and Dean Swift being weather-bound at the "Rose" Inn, sang the charms of nine host's daughter in the ballad of "Molly Mog." Pop. (1901), 3,551.

Wolcot, JOHN, poet and satirist, better known by his pen-name of PETER PINDAR, was born at Dodbrooke, near Kingsbridge, Devonshire, on May 9th, 1738. He was educated at Kingsbridge, Liskeard and Bodmin and spent a year in France to acquire the language. He studied medicine in London and graduated M.D. at Aberdeen in 1767. In the same year he accompanied Sir William Trelawny to Jamaica, the latter going out as Governor, but finding his professional prospects poor returned to London and took holy orders. He practised in Truro, Helstone and Exeter for a few years, until the success of certain of his songs which had been set to music by Jackson of Exeter induced him to give up medicine. He moved to London (where the painter John Opie, whose talents he was amongst the first to detect, was making something of a name) and in 1782 brought out, with distinct success, his *Lyric Odes to the Royal Academicians by Peter Pindar, Esq.*, a form of publication which he repeated in 1783, 1785 and 1786, when his *Farewell Odes* appeared. He afterwards took to satirising the King in his *Louisiad* (1785-95) and *Ode upon Ode* (1787), and Government made overtures to buy his silence, but the arrangement fell through

owing to Wolcot's cupidity. For twenty years he had a free hand at vituperation and satire of the cheaper sort until William Gifford (1756-1826) castigated him in the pages of the *Anti-Jacobin* and also in his *Epistle to P. Pindar* (1800). Henceforward he was a person of much smaller importance, though the volume of his satire continued to flow in undiminished quantity. He died in London on January 14th, 1819. He possessed a facile smartness, his verses read smoothly, and his works have contributed a few items to the stock of quotations.

Wolf, the name of a carnivorous animal belonging to the Thœiid or Lupine section of the Dog family, and popularly applied to the Common Wolf (*Canis lupus*), and its close allies, which some systematists rank as species, while others consider them as varieties. Wolves, with the exception of some varieties of the domestic dog, are the largest members of the family, and have a wide range in Europe, Asia and North America, but are absent from South America and Africa. They do not take their prey by stealth and cunning, as do the foxes, but gather in large bands or packs and run it down in the open. The Common Wolf was formerly abundant in Great Britain; its extinction in England did not take place till the reign of Henry VII. (1485-1509). In Scotland the last wolf is said to have been killed in 1680, but some few survived till about the middle of the 18th century. The length of a full-grown European wolf is about 40 inches, exclusive of the tail, which may be put at about 18 inches; the height at the shoulder averages 33 inches. The usual colour of the fur is yellowish or fulvous grey, but individuals from the northern parts of the Continent are usually lighter, and those from the southern parts darker in hue. The former are also larger than their fellows. Black races occur, and have been described as distinct species. The Wolf is readily tamed, and becomes as faithful and affectionate to its master as a dog, but it is not to be trusted with strangers. Wolves breed freely with the domestic dog, and some of the North American Indians are said to cross their sleigh-dogs with the wolf to get increased speed and greater endurance. The Indian Wolf (*C. palipes*) is smaller and less stoutly built than the European species, and is subject to great variation. The Tibetan Wolf (*C. laniger*) has a thick woolly pelage, yellowish-grey in colour; the black race of this form has been called *C. niger*. The American Wolf (*C. occidentalis*) is now considered identical with the European form. The Japanese Wolf (*C. hodophylax*) is doubtfully distinct. The Abyssinian Wolf (*C. simensis*), from the district of Simen or Semyen, is a large aberrant jackal rather than a true Wolf. The Antarctic Wolf (*C. antarcticus*), of the Falkland Islands, is allied to the Prairie Wolf or Coyote. The Manged Wolf (*C. jubatus*), with a wide range in South America, is a large solitary wild dog.

Wolfe, CHARLES, poet, was born at Blackhall, County Kildare, Ireland, on December 14th, 1791, educated at Bath, Winchester, and Trinity College, Dublin, and took holy orders in 1817. Of weak

constitution, he unfortunately became consumptive and died at Cork on February 21st, 1823. His name survives solely through one poem, but this was the beautiful ode on "The Burial of Sir John Moore," which originally appeared in the *Nervy Telegraph* for April 19th, 1817.

Wolfe, JAMES, General, was born, the son of Lieutenant-General Edward Wolfe, at Westerham vicarage in Kent on January 2nd, 1727. He joined an infantry regiment in 1741, and showed so much courage and capacity in the battle of Dettingen (1743) that next year he received a captain's commission. In 1745-6 he served against the Jacobites, taking part in the battles of Falkirk and Culloden. During the Seven Years' War he displayed conspicuous bravery at the battle of Lawfeldt (1747). His services in the disastrous Rochefort expedition (1757) attracted the attention of the elder Pitt, who gave him the command of a brigade in the expedition to Cape Breton under Amherst (1758). In consequence of his extraordinary courage, energy and skill at the siege of Louisbourg, he was entrusted with the chief command in the attack on Quebec, in which brilliant action he was killed on September 13th, 1759.

Wolfenbüttel, a town of Brunswick, Germany, on the Oker, 8 miles S. of Brunswick. It is interesting on account of its associations with Gotthold Ephraim Lessing (1729-81), who was keeper of the Library, containing over 300,000 volumes, from 1770 till his death. The Library possesses relics of Martin Luther and paintings by Lucas Cranach. There is a museum in the house in which Lessing wrote *Nathan der Weise*. The principal buildings of the town are the Marienkirche, St. Peter's Church, the Synagogue and the ducal palace, which now accommodates a school. The industries comprise the manufacture of textiles, machinery and preserves, in addition to ironfounding, wood-turning and nursery gardens. Pop. (1900), 17,873.

Wolf-Fish (*Anarrhichas lupus*), called also Cat-fish, Sea-cat and Sea-wolf, a large voracious fish of the Blenny family, from the North Atlantic, valued in Iceland and Greenland as a food-fish. Its appearance is fierce and repulsive, the front of the mouth being armed with tusk-like teeth and the skin covered with slime. The average length is from 3 feet to 4 feet, and the general colour brown, barred with black. Two other species occur in the North Pacific.

Wolf-Hound, an Irish breed of dogs, formerly used to hunt the wolf, but now practically extinct. The name is applied also to the Borzoi, a Russian dog, somewhat like a very large greyhound, with long soft coat. These dogs are faithful and affectionate, and there is some doubt as to whether the name "wolf-hound" is appropriate.

Wollstonecraft, MARY. [GODWIN.]

Wolseley, GARNET JOSEPH WOLSELEY, VISCOUNT, Field-Marshal, was born at Golden Bridge, County Dublin, Ireland, on June 4th, 1833. He entered the army in 1852 and served in the Second

Burmese War (1853), the Crimea (where he showed much personal bravery), during the whole of the Indian Mutiny (1857), and in the Chinese War of 1860. In 1870 he suppressed the Red River rising in Canada in the course of three months. In 1873 he commanded the expedition against Coffee Calcali, King of Ashantee, which was speedily brought to a successful issue. He was sent to reform the administration of Natal in 1874; went to Cyprus as High Commissioner in 1878; and, returning to South Africa in 1879 as Governor of Natal, the Transvaal and the neighbouring territories, reduced Sikukuni to submission. After his campaign in Egypt against Arabi Pasha (1882), who was completely vanquished in the battle of Tel-el-Kebir, he received the title of baron and was raised to the viscounty after the Soudan expedition of 1884-85. In 1890 he was appointed commander-in-chief of the forces in Ireland, and in 1895 succeeded the Duke of Cambridge as Commander-in-Chief. This post he vacated in 1900 in favour of Lord Roberts. He became General in 1882 and Field-Marshal in 1894. His books include the *Life of the Duke of Marlborough* (1894), *Decline and Fall of Napoleon* (1895) and *The Story of a Soldier's Life* (1903).

Wolsey, THOMAS, Cardinal and statesman, the son of a butcher, was born at Ipswich, Suffolk, in 1471 or possibly 1475, and educated at Magdalen College, Oxford, where he resided as tutor and master of Magdalen College School till 1500. He was then presented to the living of Limington, in Somersetshire, and, after acting as secretary and chaplain to Henry Deane, Archbishop of Canterbury, became in 1503 chaplain to Sir Richard Nanfan, Treasurer of Calais, by whom he was brought to the notice of Henry VII. His progress in the royal service was rapid, and before the close of 1509 he had been named Dean of Lincoln. His social gifts recommended him to Henry VIII., and services of a more solid character rendered during the campaign against France in 1513 were rewarded with the see of Tournai. In the course of 1514 he was appointed Bishop of Lincoln and Archbishop of York, in 1515 he was made Lord Chancellor and received a Cardinal's hat, and in 1518 Leo X. conferred upon him the office of Legate-a-latere. But it is for his foreign policy rather than his share in establishing Tudor absolutism that Wolsey is entitled to a high place in history. After the election of Charles V. to the Empire in 1519, a long struggle for supremacy in Europe began between that monarch and Francis I. of France, and it was Wolsey's aim to maintain an equilibrium in the power of the two states, and to make each dependent on English aid for any advantage. Though supported for the Papacy in 1521, on the death of Leo X., and again in 1523, on the death of Adrian VI., he nevertheless actively promoted the dissolution of the monasteries (1524-9) and testified to his love for learning by the foundation of Cardinal College (afterwards Christ Church), Oxford. His magnificence and autocracy had meanwhile raised up powerful enemies, and his failure to assist the King's divorce sealed his doom. He was deprived of the Great Seal and arrested for high treason.

He died at Leicester Abbey on November 29th, 1530, on his way to London to face his accusers. Almost his last words were of unavailing regret. "Had I but served God," he said, "as diligently as I have served the King, He would not have given me over in my grey hairs."

Wolverhampton, a town of Staffordshire, England, standing on high ground $12\frac{1}{2}$ miles N.W. of Birmingham, in the midst of rich coal- and iron-fields. A convent was founded here in the 10th century, but the town only grew into importance in the 19th century. It is now the metropolis of the Black Country. Every form of industry connected with the metal trade is carried on, and there are large factories for chemicals, colours, varnishes, papier-mâché and japanned goods. Locks and keys are special products. It received a charter in 1848, having been enfranchised in 1832. The principal buildings are the fine cruciform church of St. Peter, the Renaissance Town Hall, the Art Gallery, Grammar School, Free Library, Agricultural Hall and Corn Exchange. Pop. (1901), 94,179.

Wombat, an animal belonging to the Marsupial genus *Phascolomys*, the type of a family Phascolomyidae. There are three species, all nocturnal, living on the ground or burrowing, and feeding entirely on vegetable substances. The largest species, Mitchell's Wombat (*P. mitchelli*), some 3 feet in total length, from South Australia, may be brown, grey, or black, and has harsh coarse fur, as has also the Tasmanian Wombat (*P. ursinus*), but of a brownish-grey hue. The Hairy-nosed Wombat (*P. latifrons*), another Tasmanian species, has silky brownish-grey fur.

Wood, the general term for vegetable tissue in which the cell walls have been lignified or thickened by the secondary deposition of a substance called lignin, the tissue thereby being rendered harder and more elastic while less permeable and less absorbent. Wood only occurs in large continuous masses in the stems of the higher plants (the Phanerogamia or Flowering Plants) and presents very evident differences in structure according to the class to which it belongs. In the Monocotyledons (plants with one seed-lobe in the embryo), the Palms and Bamboos being examples, there is neither pith nor bark, nor medullary rays; the fibro-vascular bundles contain no cambium and, in their distribution throughout the fundamental tissue, are large and dispersed in the centre of the stem, becoming smaller and more crowded towards the circumference. On the other hand, the Dicotyledons (plants with two seed-lobes in the embryo), the class from which practically all hardwood timbers are derived, have a distinct pith and bark, the fibro-vascular bundles contain cambium, and are separated by medullary rays which are always present, dividing the bundles and extending from the pith to the inner bark. Viewed transversely, a dicotyledonous stem is seen to be built up of so many concentric rings, each representing the annual increment of the tree. In woods of slow growth, the distance between one ring and its successor is very small, as

in the Boxwood, while in the Willow, and other soft, quickly-grown woods, the ring is frequently half an inch in width. This has an important bearing upon the weight, hardness and density of wood. The cells also exhibit a great variation diametrically, as like-wise in their number. In some woods the pores are large and few, in others, as in the Horse Chestnut, many and small, numbering about 150 per sq. mm. Dicotyledons manifest a great diversity of colour, of which the secondary deposit is the vehicle, tropical woods generally being richer and more brilliant than those of the temperate zone. In the Gymnosperms (plants whose seeds are not enclosed in a vessel) the Conifers furnish timbers of great general utility, such as the Pine, Larch, Spruce, Cypress and Yew. In many points their stem structure resembles that of the Dicotyledons, in that they have a pith and bark, medullary rays and annual rings, with the important difference, however, that their wood may be said to contain no true vessels or trachea, but is entirely composed of elongated, spindle-shaped cells called tracheids. Coniferous woods are generally soft and durable, and mainly confined to the North Temperate zone. But there are valuable Conifers in the Southern hemisphere, such as the Kauri Pine and Totara of New Zealand, the Huon Pine of Tasmania, and the Alerce of Chile. [TIMBER.]

Wood, ALEXANDER, physician, was born at Cupar, Fife, on December 10th, 1817, and educated at the Academy and University of Edinburgh. He studied medicine especially and graduated M.D. in 1839. In the following year he was admitted Fellow of the Royal College of Physicians, Edinburgh, in 1850 became its secretary, and in 1858 was elected President, a post which he occupied for three years. Besides sedulous attention to his practice, he distinguished himself as a sanitary reformer, acting as chairman of the Association for Improving the Condition of the Poor. Professionally his chief claim to remembrance rests on the fact that he was the first to introduce the use of the hypodermic syringe for the injection of drugs. The subject had engaged him closely as early as 1853, and in 1855 he published a paper giving the earliest account of the *New method of treating Neuralgia by the direct application of Opium to the Painful Points*. The administration, as he showed, was not necessarily limited to opiates. He died in Edinburgh on February 26th, 1884.

Wood, SIR CHARLES, VISCOUNT HALIFAX, statesman, was born on December 20th, 1800, and educated at Eton and Oriel College, Oxford. Preferring a political career, he entered the House of Commons in 1826 as M.P. for Grimsby, afterwards representing Wareham (1831) and Halifax (1832), for which he was member for thirty-two years. After filling various minor posts he was Chancellor of the Exchequer from 1846 to 1852, First Lord of the Admiralty in 1855 and Secretary of State for India in 1859. In this last office his administration after the extinction of the East India Company was successful, and when he resigned the position in 1866 he was created Viscount Halifax. He died at Hickleton in Yorkshire on August 8th, 1885. He

was in no sense an orator, but had a wide knowledge of public affairs and was a safe and sound counsellor.

Wood, ELLEN, better known as **MRS. HENRY WOOD**, novelist, was the eldest daughter of Thomas Price, glove-maker of Worcester, where she was born on January 17th, 1814. In 1836 she married and the next twenty years of her life were mostly spent in France. She suffered from curvature of the spine and wrote her books in a reclining chair, the manuscript resting on her lap. Her first successful story, *Janebury House* (1860), won the £100 prize offered by the Scottish Temperance League, but her vogue was established with *East Lynne* (1861), a melodramatic tale that has had an enormous circulation. Of numerous other novels may be mentioned *Mrs. Halliburton's Troubles* (1862), *The Channings* (1862), *The Shadow of Ashlydyat* (1863), *Lord Oakburn's Daughters* (1864), *Roland Yorke* (1869), *Within the Maze* (1872), and *Edina* (1876). From a literary standpoint her best work was done under the pseudonym of "Johnny Ludlow," which she used chiefly in the *Argosy*, a magazine she had acquired in 1867. She died in London on February 10th, 1887. Though the literary qualities of her novels are poor, she displayed remarkable skill in the construction of plot.

Wood, SIR HENRY EVELYN, Field-Marshal, was born at Cressing, Braintree, Essex, on February 9th, 1838, and was educated at Marlborough School and the Staff College. He entered the Navy in 1852 and served with the Naval Brigade in the Crimean War, being seriously wounded whilst carrying a scaling ladder to the Redan. He then joined the Army and took part with the 17th Lancers in the Indian campaign, and was awarded the Victoria Cross for bravery during the Mutiny (1858). After active service in Ashantee, Zululand and the Transvaal, he was appointed to the Chatham District (1882-3), from which he was summoned to command the 2nd Division of the 2nd Brigade in the Expedition to Egypt. When Arabi's insurrection was suppressed Wood organised the Egyptian Army (1883) and afterwards returned to home duties. He commanded the Eastern District from 1886 to 1888 and the Aldershot Division from 1889 to 1893. From 1893 to 1897 he was Quartermaster-general



SIR EVELYN WOOD.
(Photo: Heynes.)

to the Forces (during this period taking part in the Expedition to Khartoum), from 1897 to 1901 Adjutant-general to the Forces and commanded the 2nd Army Corps District from 1901 to 1905. He was created K.C.B. in 1879, G.C.M.G. in 1882 and G.C.B. in 1891. Amongst his books may be named *The Crimea in 1854* (1894), *Cavalry at Waterloo* (1896) and *From Midshipman to Field-Marshal* (1906). He was admitted a barrister of the Middle Temple in 1874.

Wood, JOHN GEORGE, writer on natural history, was born in London on July 21st, 1827, and educated at home, Ashbourne, and Merton College, Oxford. He was ordained priest in 1854 and held various minor appointments in the Church. His forte lay in another direction, however. In consequence of a weak constitution he was encouraged when a boy to spend his time in the open-air and thus acquired remarkable powers of observing animal and plant life. This directed his attention to the popularising of the whole range of natural history and from 1851, when he produced *The Illustrated Natural History*, till his death at Coventry on March 3rd, 1889, scarcely a year passed in which some book from his pen did not appear. Amongst the most successful of these works were *My Feathered Friends* (1856), *The Common Objects of the Seashore* (1857), *The Common Objects of the Country* (1858), *Common Objects of the Microscope* (1861), *Our Garden Friends and Foes* (1863), *Homes Without Hands* (1864), *The Natural History of Man* (1868-70), and *Man and Beast: Here and Hereafter* (1874). From 1879 onwards he followed lecturing on his subject as a profession, making a feature of blackboard illustrations in coloured chalks, at which he was an adept. He was very successful in this line both in his native land and the United States, where he delivered the Lowell lectures at Boston in 1883-4. Wood did not claim to be a scientific writer, nor to treat of any system of natural history academically, but he had a genuine gift for handling these departments of his subject which lent themselves to popular and intelligible exposition.

Woodbridge, a town of Suffolk, England, on the Deben, 8 miles N.E. of Ipswich. Amongst the principal buildings are the church of St. Mary the Virgin in the Perpendicular style, containing the tomb of Thomas Sekforde, a generous benefactor of the town; the Grammar School, founded in 1662; the hospital in the Elizabethan style; the Shire Hall of Flemish design; the Lecture Hall and the Mechanics' Institution. Bernard Barton, the Quaker poet, became clerk to a bank in Woodbridge in 1809, and resided here till his death on February 19th, 1849. Charles Lamb's characteristic counsel to the poet was humorously expressed, "Keep to your bank, and your bank will keep you." Situated in a fine grazing and corn-growing district, the grain and cattle markets are well supplied and attended, and the Lady Fair in March is noted for its display of horses of high-class quality. There are corn mills and malt houses and iron-founding is carried on, in addition to a brisk export and import trade. Pop. (1901), 4,640.

Woodbury, WALTER BENTLEY, photographer and inventor of photo-mechanical printing processes, was born in Manchester on June 26th, 1834, and was educated on the scientific side with a view to becoming an engineer. He was seized with the gold fever, however, and in 1852 sailed for the Australian diggings, where he suffered many hardships. He finally took up photography, which had been his hobby at home, and attained to great skill in pictures of natural scenery in Java, whither he had wandered, his plates being published in London. He returned to England in 1863 and settled in Birmingham, where he produced the process of photographic engraving (called Woodburytype after himself) in which a photograph on sensitised gelatine is caused by the hydraulic press to indent a sheet of lead from which a printing block is ultimately made. He also invented the Stannotype, in which the printing is done from a surface of tin, and many other processes and photographic paraphernalia. Of these the Woodburytype attained to the widest degree of popularity. The inventor died suddenly at Margate on September 5th, 1885.

Woodchat (*Lanius pomeranus*), a shrike having its home in Southern Europe and Africa, but occasionally visiting Great Britain. Its length is about seven inches and the plumage on the upper surface is mostly black-and-white, and white below.

Woodcock, a bird belonging to the genus *Scelopax*, type of a family Scolopacidae. These birds are allied to the snipes, but are larger and more stoutly built, with shorter legs. The Common Woodcock (*S. rusticola*) is a winter visitor to the British Isles, returning northwards in spring. Many remain to breed, and of late years the number has noticeably increased. The length is nearly 15 inches; the plumage on the upper surface is rufous-brown, with small black markings; the under surface is wood-brown, marked with dark bars. The woodcock feeds on worms, insects and small crustaceans, and is highly valued for the table.

Woodfall, HENRY SAMPSON, printer and journalist, was born in London on June 21st, 1739, and educated at Twickenham and St. Paul's School, where one of his comrades was Sir Philip Francis. He showed remarkable precocity in the classics, and when five years old received half-a-crown from Alexander Pope for reading a page of Homer in the original Greek. He was apprenticed to his father, the printer of the *Public Advertiser*, in 1754 and six years afterwards became himself the printer and latterly the editor, one of his correctors of the press being Alexander Cruden, compiler of the well-known *Concordance to the Bible*. Woodfall's claim to fame is that he published the Letters of Junius in his newspaper and was subject to several prosecutions for them and other matters, being prosecuted for libel in 1784 by Edmund Burke (who sought £10,000 and obtained £100). Reviewing his career Woodfall said "he had been fined by the House of Lords, confined by the House of

Commons, fined and confined by the Court of King's Bench, and indicted at the Old Bailey." He sold his interest in the *Public Advertiser* in 1793, was Master of the Stationers' Company in 1797 and died at Chelsea on December 12th, 1805. He published, in 1772, in volume form, *The Compleat Edition of the Letters of Junius*. Though Sir Philip Francis was a contributor to his newspaper, Woodfall (who had, however, no personal acquaintance with Junius) declared that Francis never wrote a line of Junius.

Wood-Louse, the most familiar member of the order of Isopoda. The wood-lice live under stones, leaves, etc., and roll themselves into a ball for protection when frightened. They belong to the genus Oniscus.

Wood-Owl (*Strix stridula* = *Syrnium aluco*), a common British species, ranging northwards as far as Caithness and the Inner Hebrides. The total length is about 14 inches, and the plumage is reddish-brown with darker markings and light spots on the wings. [OWL.]

Woodpecker, a bird belonging to the Picarian family Picidae, which contains some 250 species, widely distributed, but altogether absent from the Australian region. The bill is long and strong, and the extensible tongue is set at the tip with horny barbs; in the typical sub-family the tail feathers are stiff, and are used by the birds as a support when clinging to timber in search of insects. Three species are British. The Green Woodpecker (*Greenus viridis*) is common in some parts of England. Its length is about a foot; the general plumage is green, with some crimson on the head and neck, and black on the cheeks. The Great Spotted Woodpecker (*Dendrocopos major*), some nine inches long, and the Lesser Spotted Woodpecker (*D. minor*), little more than five inches long, have black and white plumage. The nest is a hole in a tree, hewn out by the strong bill.

Wood-Pigeon. [PIGEON.]

Woods and Forests, a department of the British Government, under the control of "the Commissioners of Woods, Forests, and Land Revenues and of Works and Public Buildings." Its duties are indicated by its title, but it is charged with the superintendence of the royal parks in and near London and the other royal demesnes surrendered in 1760 by George III. in return for an increase of his Civil List. The chief forests under its jurisdiction are the New Forest, Dean Forest and Windsor Forest.

Woodstock (that is, "the woody place"), a town of Oxfordshire, England, on the Glyme (formerly styled the Ennis), 9 miles N.W. of Oxford. It is a place of considerable antiquity, Alfred the Great having resided here, it is said, while translating the *De Consolatione* of Boethius. Woodstock was a favourite residence of Henry I. and the scene of Henry II.'s *liaison* with fair Rosamond Clifford. The town was incorporated by Henry VI. in 1453, his charter being extended by successive monarchs, that granted by Charles II. continuing in force till

1882. Elizabeth was a prisoner here for the year following May 1554, and visited the place twice after her accession to the throne. During the Civil War it sided with the Royalists, but yielded to the Roundheads' siege on April 20th, 1646. As a reward for the famous victory of Blenheim (1704) the manor was given to the Duke of Marlborough and Blenheim Palace built from designs by Sir John Vanbrugh. The borough sent members to Parliament from 1301 to 1885, its latest distinguished representative being Lord Randolph Churchill. The church of St. Mary Magdalene, originally Norman, exhibits Decorated, Early English and Perpendicular features. The town hall (1766) was designed by Sir William Chambers, the architect of Somerset House in London. Caroline, Duchess of Marlborough, erected and endowed almshouses in 1798. The making of leather gloves is an ancient industry. Elizabeth was presented with a pair by the glove-makers on the occasion of one of her visits, and in 1616 the University of Oxford presented James I. with "very rich gloves" of Woodstock manufacture. The town has interesting literary associations as the scene of Sir Walter Scott's novel of *Woodstock* and the ballad of the "faire and comely dame" who won the love of the second Henry, who "at Woodstocke builded such a bower, the like was never seen," for her accommodation. Pop. (1901), 1,684.

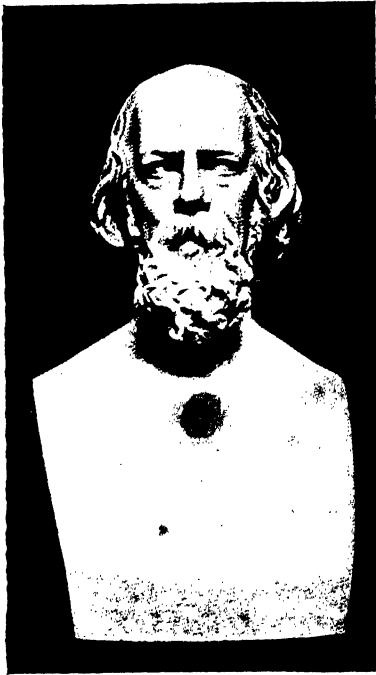
Wookey Hole, a cavern two miles W.N.W. of Wells, Somerset, England, alleged to communicate with the cliffs of Cheddar. It is of interest to the zoologist and anthropologist, since it contains the bones of several animals such as the hyæna, rhinoceros, bear and other creatures no longer found in the British Isles. Flint implements of Palæolithic man have also been discovered. The cave was noticed by Clemens of Alexandria, who flourished in the 2nd century, and also by William of Worcester (1415-90). The river Axe flows out of it in a rapid current. The population of the parish of Wookey, in which the cavern is situated, is 975.

Wool, in its widest sense, denotes an animal covering partaking in a great measure of the nature of hair, the difference between them being in some respects hard to determine. The name is also applied by analogy to the fibres of vegetables, notably cotton. For many centuries it has formed the staple of one of the principal textile manufactures in Great Britain. British wool supplies being wholly inadequate to meet the demands of the industry, enormous quantities are imported every year from Australia, New Zealand, Tasmania, the Cape, India and South America. In England the chief seats of the industry are found in the West Riding of Yorkshire, Wiltshire and Gloucestershire; in Scotland in Hawick, Galashiels and Alloa, and in the United States in Connecticut, Massachusetts, New Hampshire, New York, Pennsylvania and Rhode Island. The **WOOLSACK**—the large square bag, without back or arms, stuffed with wool and covered with red cloth, on which the Lord Chancellor sits in the House of Lords at Westminster—is said to have been devised expressly to keep in

perpetual memory the fact that wool was a leading source of the national wealth of England.

Woolly Bear, the caterpillar of the Tiger Moth (*Arctia caja*). It has long woolly hair, and is of a red colour.

Woolner, THOMAS, sculptor and poet, was born at Hadleigh in Suffolk on December 17th, 1825, and educated at Ipswich. He was but a boy when his



TENNYSON (ABOUT 1870).

(From the bust by T. Woolner, R.A.)

father removed to London and at once placed him in the studio of William Behnes, the sculptor, where his remarkable powers were speedily made evident. His earliest works were almost wholly idealistic, such as "Alastor" (1846) and "Puck" (1847), and for them there was small demand and he had perforce to continue to devil for Behnes for a living. He made the acquaintance of Dante Gabriel Rossetti in 1847 and became one of the founders of the Pre-Raphaelite Brotherhood. His outlook, however, remained so unpromising that he sailed for Melbourne in 1852 to try his luck at the diggings. His sufferings there were considerable and almost the only gold he won was that obtained for portrait-busts. On his return to England in 1854 he found that his Pre-Raphaelite friends had succeeded in stirring the artistic conscience and commissions soon came to him and in a few years he was placed in easy if not affluent circumstances.

He was elected A.R.A. in 1871 and R.A. in 1874. In portraiture his best works are his busts of Tennyson, Gladstone, Darwin, Carlyle and Robert Browning, his life-size or colossal statues of John Stuart Mill (on the Thames Embankment), Bacon (New Oxford Museum), Lord Macaulay (Trinity College, Cambridge) and Bishop Fraser (Manchester). He achieved nothing finer than his figure of "The Housemaid," finished a few weeks before his death, which took place in London on October 7th, 1892. His poetry was rather cold and statuesque. Amongst his most admired works were *My Beautiful Lady* (1863), originally published in part in the Pre-Raphaelite *Germ*, *Pygmalion* (1881), *Silenus* (1884), *Tiresias* (1886) and *Poems* (1887).

Woolsorters' Disease. [ANTHRAX.]

Woolwich, a town of Kent, England, on the right bank of the Thames, 8 miles E.S.E. of London. Here a dockyard was established by Henry VIII., but the prosperity of the town dates from 1716, when the military arsenal was transferred here from Moorfields. It is one of the largest establishments of the kind in the world, and contains a gun-factory, laboratory, barracks for artillery and engineers, etc. St. George's Garrison Church, the Royal Military Academy, Herbert Hospital, and the Military Museum are among the principal buildings. Woolwich Common provides a fine parade ground, and ranges for testing cannon are set up on Plumstead Marshes. North Woolwich, on the left bank of the river, is connected with it by steam-ferry and contains the Royal Victoria Gardens. Pop. (1901), 117,178.

Woolwich Beds, a sub-division of the Lower Eocene system, resting in the London basin conformably upon the Thanet Sands, but in the Hampshire basin directly upon the Chalk. They consist of clays and sands of various colours and shades, with pebble-beds, conglomerates, lignite and shell-beds, varying in thickness in very short distances. They were formerly termed the Plastic Clay, the name *Argile plastique* being still employed for their equivalent in the Paris basin. The lowest bed of the series is generally a pebbly sand with sharks' teeth and the shells of a large oyster, *Ostrea bellovacina*, which occur in England at Reading in the west, Headley in the south, Bromley, Woolwich, etc., and in the Isle of Wight. At Reading and in Belgium plant remains occur near this horizon, and at Woolwich the lower beds contain estuarine shells, such as *Melania* and *Cyrena*, and even freshwater forms, such as *Viviparus*. The upper beds are more marine, with fish-teeth and frequent shingle-beds, which last, in Hertfordshire, are consolidated into a hard puddingstone or conglomerate. These shingles are classed separately as Oldhaven beds.

Woonsocket, a town of Rhode Island, United States, on the Blackstone, 37 miles S.W. of Boston. It has extensive manufactures of cotton, silk and woollen fabrics, and iron and rubber goods are also made. In the neighbourhood market-gardening and dairy-farming are vigorously carried on.

Among the more important buildings are Harris Institute Library and the College of the Sacred Heart. Pop. (1900), 28,204.

Worcester, the capital of Worcestershire, England, on the left bank of the Severn, 26 miles S.W. of Birmingham. It is one of the most ancient cities in the kingdom, having been the site of a Celtic settlement, a Roman camp and a Saxon fortress. The Gothic cathedral was founded in 680 and rebuilt in the 13th century, and there are other churches of interest. The Guildhall, Shire Hall, Infirmary, Grammar School, Free Library and Natural History Museum are the chief secular buildings. The Royal Worcester porcelain works, established in 1751, are famous for the artistic beauty of their wares. Glove-making is an industry of still earlier date. Chemicals and artificial manures, cider, British wine and vinegar, hardware, lace and sauces are also manufactured. There is a good market and a large trade is carried on in local produce by rail and river, whilst salmon-fishing flourishes in the neighbourhood. Cromwell in 1651 gained here a decisive victory over the Royalists. Pop. (1901), 46,623.

Worcester, a town of Massachusetts, United States, near the Blackstone, 44 miles W. by S. of Boston. The principal buildings are the City Hall, Court House, Free Library, Art Museum, American Antiquarian Society, Clarke University, Polytechnic Institute, Academy, College of the Holy Cross and the Highland Military Academy. It has the largest wire works in the world, besides manufactures of envelopes, textiles, railway cars, firearms, tools, organs and pianos, boots and shoes. Pop. (1900), 118,121.

Worcester, EDWARD SOMERSET, 6th Earl and 2nd Marquis of Worcester and titular Earl of Glamorgan, Cavalier general and inventor, was born in 1601 and educated at home and abroad. On the outbreak of the Civil War, he undertook the charge of Charles I.'s interests in Wales, but his operations generally were unsuccessful. In 1644 he was created Earl of Glamorgan and, the King's fortunes being in a somewhat precarious state, was privately authorised to proceed to Ireland in order to raise two separate armies which were to effect landings, the one in North Wales and the other in South. The Earl of Ormonde, who was Lord-Lieutenant and a firm Protestant, however, refused to sanction the concessions which Glamorgan, himself a strong Catholic, was prepared to make to the Catholics to secure their adhesion to his plans. Moreover, the treaty under which he acted was discovered in 1645 and published and caused immediate consternation in Ireland. Glamorgan, being at once arrested, declared that he had the King's warrant for everything he had done, but Charles repudiated the treaty and assured Parliament that Glamorgan was instructed to initiate no movement or policy without Ormonde's knowledge and consent. He even impugned the patent creating him Earl of Glamorgan. But with wonted duplicity he told Henrietta Maria that Glamorgan had been guilty only of too great zeal and to Glamorgan he wrote

privately ratifying the earldom and assuring him of a continuance of the royal favour. Glamorgan was released on bail early in 1646, in which year he succeeded to the marquisate, and intrigues were set on foot for his election as Lord-Lieutenant. The army and the English faction stood by Ormonde, however, and Worcester, recognising that he could no longer be of service to the King, retired to Paris, where he remained for four years. Parliament outlawed him, sequestered his estates and pronounced his life forfeit. Worn out by hardships he put all to the hazard and returned to England. He was promptly arrested and lodged in the Tower in 1652, but no indictment was prepared and he was released two years afterwards, probably through Cromwell's inclination to mercy and also out of regard for his age and the sufferings he had undergone. After the Restoration his estates were restored and many debts remitted, but his claim to the dukedom of Somerset was rejected and even his title to the earldom of Glamorgan was not recognised. Henceforward he devoted himself to mechanical studies and pursuits, to which he had, though intermittently, been attracted from his youth upwards. He spent much time in attempting to solve the problem of perpetual motion, and in 1663 published his *Century of the Names and Scantlings of such Inventions as at present I can call to mind to have tried and perfected*. Most of these notions are chimerical and nearly all described in language so vague and bombastic as to be difficult if not impossible to grasp. A few ideas, such as short-hand, were not new, and a few, such as the calculating machine, may have afforded hints to later inventors. His claim to be the inventor of the steam-engine rests upon his "water-commanding engine," a hydraulic machine for raising water to a certain height, but such an invention was too remote from even the crudest form of steam-engine to be entitled to be regarded as the germ or forerunner of the latter. Worcester died, probably at Lambeth, on April 3rd, 1667, and was buried in Raglan churchyard.

Worcestershire, a midland county of England, bounded on the N. by Staffordshire, on the E. by Warwickshire, on the S. by Gloucestershire, on the W. by Herefordshire and on the N.W. by Shropshire. It covers an area of 739 square miles. The surface is undulating, with high ground to the north-east, and the Malvern Hills (1,400 feet) to the south-west. Lying in the basin of the Severn, and drained by the Teme, Stour and Avon, it is well watered and fertile, wheat, hops, cider-apples, pears and other kinds of fruit being the chief products. There are rich pastures for sheep, cattle, pigs and horses in the river valleys. Coal, iron and salt are abundant in the north. Dudley is the centre of the coal and iron trade, and Droitwich of the salt district. Carpets and rugs are made at Kidderminster, glass at Stourbridge, and fish-hooks and needles at Redditch. Pop. (1901), 358,377.

Worde, WYNKYN DE, printer, was born at Wörth, in Alsace, in the latter half of the 15th century. His real name was Jan van Wynkyn, "de Worde" (Wörth) being only a place name. He

went to London and apprenticed himself as a printer to William Caxton and, after the latter's death in 1491, carried on the business at Westminster. He took no interest in the literary side of his craft—in this respect differing markedly from Caxton—but prospered as a printer. Amongst some of the books that issued from his press were editions of the *Golden Legend*, *Morte d'Arthur*, and *The Canterbury Tales*. In 1500 he removed to Fleet Street, where he set up an office at the sign of "The Sun." The character of his business became somewhat modified, for besides producing costly folios for the wealthy, he now laid himself out to cater for the community, and printed several books of devotion, grammars and other school-books and popular tales. Business still growing, he opened in 1509 an additional shop in St. Paul's Churchyard (already a recognised centre for booksellers) with the sign "Divine Marie Pietatis." He died at the end of 1534, or the beginning of 1535, and was buried in St. Bride's Church, Fleet Street, close to which stood "The Sun" office.

Wordsworth, WILLIAM, poet, was born at Cockermouth in Cumberland on April 7th, 1770. His father was agent to the 1st Earl of Lonsdale. Before his fourteenth year William had lost both parents. He received his education at Hawkshead Grammar School, Lancashire, and St. John's College, Cambridge. After leaving the university he led a somewhat desultory life, unwilling to enter the Church, and not as yet fully conscious of his true vocation. He was drawn to France by his sympathy with the Revolution, unsullied as yet by the horrors which afterwards produced so powerful a reaction in his mind, and, after his return to England, published, in 1793, his *Evening Walk and Descriptive Sketches*. He afterwards spent several years in Dorsetshire and Somersetshire with his sister Dorothy (1771–1855), a woman of ardent temperament and keen poetic insight, who from his earliest years supplied those "gentler charities," in which, as Thomas De Quincey says, his "stern and austere" genius was by nature somewhat lacking. During this period he saw much of Samuel Taylor Coleridge, and the two poets no doubt exercised a reciprocal influence. In 1798 they published a volume of *Lyrical Ballads*, containing, among other pieces, Coleridge's "Ancient Mariner" and Wordsworth's "Lines Composed above Tintern Abbey." In the same year the brother and sister made an expedition to Germany, and some of the happiest of his shorter poems were written during a bitterly cold winter at Goslar. Soon after their return they took up their abode in a cottage at Grasmere. In 1802 Wordsworth married his old schoolmate and playfellow Mary Hutchinson. In 1813 the Wordsworth household removed to Rydal Mount, and there the poet spent the remainder of his life. The most ambitious, but not the greatest, of his efforts was the *Excursion* (1814), a long philosophical poem in blank verse, which elicited Francis Jeffrey's "This will never do" in the *Edinburgh Review*. In 1843 he succeeded Robert Southey as poet laureate. He died at Rydal on April 23rd, 1850, and was buried in Grasmere churchyard. For many years before his death he

enjoyed in full measure the recognition and honour which had been denied him in his younger days. In common with all the great poets of his own and the next generation, Wordsworth was deeply affected by the movement of thought which swept over Europe during the closing decades of the 18th century. On its political and social side this movement has become closely associated with all that was best in the French Revolution. In the imaginative sphere its first tendency was to lead man back from the artificial life of towns to the grandeur and simplicity of Nature; but it did much more for him than this—it opened up for him new possibilities in his spiritual life, taught him to find a deeper meaning in every sight and sound of the external world; it may almost be said to have given him a new soul. The dazzling hopes thus inspired might well breed strange visions in over-impulsive minds, but Wordsworth's was one of those rare natures, richly endowed with all high gifts, in which the æsthetic, emotional and religious elements are so happily blended that every fresh gleam of poetic insight is at the same time a revelation of ancient and eternal truth. CHRISTOPHER WORDSWORTH (1774–1846), the laureate's youngest brother, was Master of Trinity College, Cambridge. He had three sons, JOHN (1805–39), classical lecturer at Trinity College, CHARLES (1806–92), the first Warden of Trinity College, Glenalmond, and afterwards Bishop of St. Andrews, and CHRISTOPHER (1807–85), Bishop of Lincoln. The last two were famous athletes at their 'varsity.

Work must always be expended when a force is overcome. Thus in lifting a stone the force overcome is the weight of the stone, and the work done is proportional to the weight and to the distance through which it is raised. If the stone be moved up a smooth inclined plane, it is not the actual space through which it moves which is of importance, but the vertical distance; in fact, the amount of work is estimated by taking account of the distance moved through only in the direction of the force. If the inclined plane be rough, as it always would be, a fresh force comes into play—that of friction—and, since friction acts along the plane, the work done against this force will be proportional to the actual distance travelled along the plane. Work may be done in overcoming many other kinds of force—thus, in order that a current of electricity may be produced when a wire is moved in a magnetic field, work must be expended in moving the wire, and work must be also spent in compressing a spring—the elastic force being overcome in this case—and work is done on a body in order to alter its velocity. In the latter case the work done is exactly equivalent to the alteration of the kinetic energy of the body, which is measured by the product of half the mass and the square of the increase in the velocity. When friction is overcome all the work is converted into heat, and James Prescott Joule and others have shown the connection between the work expended and the quantity of heat evolved. [THERMODYNAMICS.]

Workington, a seaport of Cumberland, England, at the mouth of the Derwent, 6½ miles N. by

E. of Whitehaven. The principal buildings are St. Michael's Church, rebuilt in the Decorated style after the fire of 1887, the Town Hall, Free Library, Infirmary and Hospital for Infectious Diseases. The manufactures include iron, steel rails, tinplates, bridges, boilers, rivets and paper, besides brewing and shipbuilding. Mary Queen of Scots landed here on May 16th, 1568, during her flight after the battle of Langside and was received at Workington Hall. Pop. (1901), 26,141.

Workshop, a town of Nottinghamshire, England, 12 miles N.E. of Mansfield. It is as old as Domesday, in which it is mentioned as Withercope. Of the Priory, founded in the reign of Henry I. for Black Canons, the church of St. Mary and St. Cuthbert, originally Norman, is the principal relic.



CLUMBER FROM THE SOUTH-EAST.

(Photo: Wilson, Aberdeen.)

The Late Gothic gateway forms the entrance to the precincts of the church, behind which are the ruins of the Lady Chapel, which still exhibits some beautiful Early English work. Other buildings include St. John's Church, the Town Hall, the Corn Exchange, Mechanics' Institute and the Criterion Hall. Malting is the leading industry, and there are brass and iron foundries, saw mills and chemical works, and agricultural implements are also made. Liquorice used to be largely cultivated in the vicinity. Mary Queen of Scots was a prisoner, under the care of the 6th Earl of Shrewsbury, in the old Manor, which was destroyed by fire in 1761. The surrounding country is extremely picturesque, and from the fact that it contains, besides the Manor (once the property of the Duke of Norfolk, but now the Duke of Newcastle's), the Duke of Newcastle's seat of Clumber Park, the Duke of Portland's of Welbeck Abbey, and Thoresby Hall (once the property of the Duke of Kingston, but now belonging to Earl Manvers), is called the Dukeries. Pop. (1901), 16,112.

Worms. [VERMES.]

Worms, a city of the Grand Duchy of Hesse-Darmstadt, Germany, 26 miles S.E. of Mainz, near the left bank of the Rhine. It dates from before the Roman period, and attained its greatest prosperity in the 13th century, when it was an Im-

perial city. The Diet of Worms in 1495 was summoned by Maximilian I., and before another, held in 1521, Luther appeared. The streets are narrow and gloomy, and the Romanesque Dom (8th to 12th century) has suffered much from time. The Liebfrauenkirche offers a fine example of 11th-century Gothic. There is a colossal monument to Luther (1868). Other notable buildings are the Pauluskirche, the Synagogue, one of the oldest in Germany, the Heyl House and the Volkstheater. There are manufactures of machinery, textiles, leather and chemicals. The esteemed light wine Liebfrauenmilch is made in the district. Pop. (1905), 43,841.

Wormwood, a general name for the various species of the Composite genus *Artemisia*, shrubby plants, the wood of which was formerly much employed as a vermifuge. They have divided and generally glaucous leaves and panicles of small flower-heads, generally rayless, with an imbricate involucre, naked receptacle, and no pappus to their fruits. There are 180 species, four of which are British. Many of them inhabit arid steppes, such as the alkali bush of the Western United States, and the *Santonica* of the Kirghiz region (*A. pauciflora*). The unopened flower-heads of the latter

are known as wormseed, and contain the crystalline santonin, $C_{15}H_{12}O_6$. *A. Mosca* is used in China and Japan in the preparation of the pellets employed in their remarkable system of wholesale cauterization known as "moxa." Several Continental species are used in the manufacture of the liqueur known as absinthe.

Worsborough, a town of the West Riding of Yorkshire, England, 9 miles N. of Sheffield. St. Mary's Church, containing some Norman work, but chiefly Early English, was restored in 1864. The church of St. Thomas is in Early English. The leading manufactures are gunpowder, iron and steel, glass, paper and flour, and there are extensive collieries in the neighbourhood. To the south-east is Wentworth Castle, built in 1730 by Thomas, Earl of Strafford. Pop. (1901), 10,336.

Worsley, PHILIP STANHOPE, poet, was born at Greenwich on August 12th, 1835, and educated at the Cholmeley Grammar School, Highgate, and Corpus Christi College, Oxford, where he gained the Newdigate Prize in 1857 with *The Temple of Janus*. He was made fellow of his college in 1863. In consequence of his invalid condition he was unable to pursue any active calling and devoted himself to study and poetry. In 1861 he published a translation of the *Odyssey*, and in 1865 of twelve books of the *Iliad*. He died of consumption at

Freshwater, Isle of Wight, on May 8th, 1866. Purposely choosing the Spenserian stanza, probably the most unsuitable metrical form for a rendering of Homer, he achieved the highest possible measure of success. Matthew Arnold declared that in Worsley's hands the stanza had yielded more to him than to Byron. The inherent difficulty of his task is less apparent in the *Odyssey*, the spirit of which lends itself to the romantic stanza, than in the *Iliad*. Worsley's *Iliad* was completed by John Conington (1825-1869), a finer scholar but a greatly inferior poet.

Worstead, a town of Norfolk, England, 11 miles S.S.E. of Cromer. It is of interest principally



WORSTEAD CHURCH.

(Photo: Pictorial Agency.)

as being the original seat of the manufacture of worsted goods in England, the industry, in fact, deriving its name from this place. The chief building is the Perpendicular church of St. Mary. Pop. (1901), 781.

Worth, CHARLES FREDERICK, designer of dresses, was born at Bourne, Lincolnshire, in 1825. Apprenticed to a firm of linendrapers in London, he developed a keen interest in French materials and models and, on the expiry of his time, went to Paris, where he was employed for several years at a silk-mercier's. One of his designs for a lady's train was shown at the Exposition of 1855. Having entered into partnership with a Swede named Bobergh, he started as a lady's tailor and, gaining the custom of the Princess Metternich and then of the Empress Eugénie, he speedily obtained the finest business in Paris. He was regarded as the dictator of Fashion, his rooms in the Rue de la Paix were crowded, and his name became a household word. After the Franco-German War Bobergh retired and Worth carried on the business, with the help of his sons, his income for many years amounting, it is said, to £50,000. He died on March 10th, 1895, and was buried at Suresnes.

Worthing, a watering-place of Sussex, England, 12 miles W. of Brighton. Sheltered by the Downs from the north and easterly winds, it enjoys a high reputation for its mild and equable climate and is a popular health and holiday resort. The principal buildings are the Town Hall, Assembly Rooms, Literary Institution, Infirmary and several convalescent homes. The leading industry is connected with the raising of fruit, vegetables and flowers for the London market, but some fishing, chiefly herring and mackerel, is carried on. Pop. (1901), 20,006.

Wotton, SIR HENRY, diplomatist and poet, was born at Boughton Hall, in Kent, in 1568, and educated at Winchester and New and Queen's Colleges, Oxford. In 1588 he set out for a prolonged tour on the Continent, during which he conceived a liking for the career of a diplomat and was employed in a confidential capacity by Robert Devereux, 2nd Earl of Essex. Compromised by his patron's fall he withdrew to Venice, where he composed his prose work on *The State of Christendom* (published 1657). Having ingratiated himself with James VI. of Scotland, on Elizabeth's death, he returned to London, was knighted, and appointed ambassador at Venice (1604). He was the author of the witty definition of an ambassador as "an honest man sent to lie abroad for the good of his country," which got him into trouble in London when it became known. In 1624 he was appointed Provost of Eton, where he died in December, 1639. He was on friendly terms with the literary men of his time, notably with Izaak Walton, who wrote his *Life*. His chief works were *Reliquie Wottonianæ* (1651 and later editions) and his poems, which include the fine verses on "The Character of a Happy Life," and "On his Mistress, the Queen of Bohemia."

Wounds are sometimes divided into two classes, those in which the skin remains intact (subcutaneous wounds) and open wounds; the latter, according to the nature of the injury by which they are occasioned, are classed as incised, punctured, lacerated, and contused. A poisoned wound is one in which some poison has been inserted beneath the skin at the time of infliction of the injury (e.g., dissecting-room wounds, or wounds inflicted by the sting or bite of an animal).

Wouverman, PHILIP, painter, was born at Haarlem, Holland, in May, 1619. He became the pupil first of his father and afterwards of Jan Wynants and Evert Decker. In 1640 he was admitted to the Guild of Painters in Haarlem, where he died in May, 1668. He was a painter of extraordinary fecundity, producing hundreds of representations of cavalry charges, hunting and hawking scenes, encampments and the like. His drawing of animals was exceedingly accurate and spirited, and he had a fine sense of balance and composition. His fondness for introducing a white horse in a prominent point of a picture is a characteristic mannerism.

Wrasse, a fish belonging to the genus *Labrus*, type of a family *Labridæ* widely distributed in

tropical and temperate seas. The genus has nine species, two of which are British—the Ballan Wrasse (*L. maculatus*), about eighteen inches long, and the Striped or Red Wrasse (*L. mixtus*), a few inches less. These fish frequent rocky shores and feed on crustaceans and molluscs.

Wraxall, SIR NATHANIEL WILLIAM, writer of Memoirs, was born at Bristol, England, on April 8th, 1751, and educated at a local school. Much of his youth was spent in travel and adventure, for which he had a *penchant*. For three years he was in the employ of the East India Company (1769-72) and afterwards warmly took up the cause of Caroline Matilda, Queen of Denmark and sister of George III., whom he interviewed (1774) during her imprisonment at Celle. His efforts to induce George III. to intervene on her behalf were terminated by her sudden death in 1775. For a while he continued to lead a vagrant life, by no means lacking in interesting episodes. In 1776 Dr. Dodd, then in Newgate, begged him to procure a pardon and in 1779 he saw Prince Charlie half-drunk at Florence and afterwards met Lady Hamilton at Naples. In 1780 he entered the House of Commons and took an active part in party politics for the next fourteen years, his main exploit being his (anonymous) pamphlet, "A Short Review of the Political State of Great Britain," (1787), in which the Prince Regent was so frankly characterised that he threatened the publisher with a libel action. The secret of the authorship had been well kept, for Wraxall was a frequent visitor at Carlton House and in 1813, on the Prince Regent's nomination, was created a baronet. In 1815 appeared the *Historical Memoirs of My Own Time*, to which he owes his reputation. It is a gossip, interesting work, not without value, but needing to be verified in points. Wraxall died at Dover on November 17th, 1831.

Wreck-Fish (*Polyprion cernium*), the Stone Bass, from European coasts. It owes its name to the fact that it is often found near floating wood, the small marine animals thereon affording a good food-supply.

Wrekin, a hill of Shropshire, England, 2 miles S.W. of Wellington. It is of elliptical form, 1,320 feet in height, and extends for fully a mile in a north-easterly to south-westerly direction. It is a well-known landmark, and its summit commands a splendid view. On the north side are the remains of British camps, said to bear the extraordinary names of Heaven's Gate and Hell's Gate.

Wren, a bird belonging to the genus Troglodytes, type of the Passerine family Troglodytidae. The bill is of moderate length and pointed, with the nostrils at its base, and covered by a membrane; the wings are very short, concave, and rounded, and the tail is generally short and erect. The plumage is long and soft. The family has nearly a hundred species. Of the type-genus there are fifteen species, ranging over the Neotropical, Nearctic, and Palearctic regions to the Himalaya. Worms and insects constitute the chief food. The Common Wren (*T. parvulus*) is resident nearly all over the British

Isles, and in autumn migrants arrive from the north. The total length is about $3\frac{1}{2}$ inches, and the plumage is reddish-brown marked transversely with bars of a darker hue. The under surface is white tinged with yellow.

Wren, SIR CHRISTOPHER, architect, was born at East Knoyle rectory in Wiltshire on October 20th, 1632, was educated at Westminster and Wadham College, Oxford, where he gained a reputation as a mathematical scholar, and in 1653 was elected to a fellowship at All Souls'. He was Professor of Astronomy at Gresham College, London, from 1657 to 1661, when he became Savilian Professor of Astronomy at Oxford. In the same year he was appointed assistant to Sir John Denham, surveyor-general of the royal works, whom he succeeded in 1668. Meanwhile, in 1663, he had been entrusted with the preparation of plans for the restoration of Old St. Paul's, but after the Great Fire of 1666 it became necessary to rebuild the entire edifice. This work occupied him from 1675 to 1710. The design of the cathedral was taken from that of St. Peter at Rome. A colossal disaster had given him a unique opportunity and he rose to the height of the occasion, designing many of the buildings in the new City of London. Among his most famous secular buildings in the metropolis and elsewhere were the Sheldonian Theatre and Ashmolean Museum in Oxford, Trinity College Library, Cambridge, Temple Bar, The Monument, London, and Greenwich Hospital. In 1718 Wren was deprived of his office of surveyor-general for political reasons and died at Hampton Court on February 25th, 1723. He was President of the Royal Society, which he had been instrumental in founding, from 1680 to 1682. He was knighted in 1673 and in Parliament represented Plympton from 1685, Windsor from 1689 and Weymouth from 1701.

Wrexham, a town of Denbighshire, Wales, 11 miles S.S.W. of Chester, on a lefthand feeder of the Dee. Described by the poet Thomas Churchyard (1520-1604) as the "pearl of Denbighshire," it is still attractive and prosperous. The church of St. Giles contains a remarkable monument by Roubiliac to Mary Middleton, representing her as rising from the grave at the Last Day. Other prominent buildings are the County Hall, Market Hall, Art School, Free Library and the Free School founded in 1603. There are extensive coal-mines in the vicinity, and other industries comprise brewing, malting, tanning and paper-making. The town is also an important agricultural centre. It was occupied by the Parliamentary troops during the Civil War and Cromwell is said to have utilised the church as a prison. At Acton Park, one mile to the N.E., Judge Jeffreys was born in 1648. Pop. (1901), 14,966.

Wright, JOSEPH, painter, commonly styled Wright of Derby, to distinguish him from Richard Wright (1735-75), the sea painter, was born at Derby, England, on September 3rd, 1734. He studied art under Thomas Hudson and soon acquired a local reputation. He had a remarkable fondness for chiaroscuro, to which he gave special attention, his

work in this line being well exemplified by "The Gladiator" (1765), "The Orrery" (1766) and "The Air Pump" (1768). He spent two years (1773-5) in Italy and, if one may judge from the number of eruptions he painted, seems to have been chiefly impressed with Vesuvius. In 1781 he was elected A.R.A. and in 1784 a full member. His relations with the Academy afterwards grew strained from differences about the hanging of his works. As a portrait-painter he was very happy with children and was always sincere in feeling and careful in modelling. He painted numerous compositions both in *genre* and sentiment, but his merit was very unequal, perhaps the best being "Edwin" from *The Minstrel* and "Maria" from *Sterne*. Wright died in Derby on August 29th, 1797.

Wrist-Drop. [PAINTER'S COLIC.]

Writ, a document issued in the King's name and under seal of the Crown, or the Lord Chancellor, or other officer of the Crown, commanding the person to whom it is addressed to do or to forbear from doing some act. There are two descriptions of writ: (1) prerogative and (2) of right. The former are so called because they are issued by virtue of the Crown's prerogative; the latter are of two sorts, original and judicial. The only instance of an original writ now existing is the writ of error used in criminal proceedings. A judicial writ is of several kinds: as (1) the writ originating actions and other proceedings, (2) interlocutory writs, (3) writs of execution, etc.

Writer's Cramp. [CRAMP.]

Writing. [PALÆOGRAPHY.]

Writing-Machine. [TYPEWRITER.]

Wroxeter, a village on the left bank of the Severn, 6 miles S.E. of Shrewsbury, Shropshire, England. It is of exceptional interest as the site of the Roman station of *Uriconium* on Watling Street. Part of the walls (which surrounded an area measuring 1,380 yards from north to south, and 1,000 yards from east to west), with ditch and rampart, still remains and numerous Roman relics have been excavated from time to time. Pop. (1901), 566.

Wryneck, a bird belonging to the genus *Jynx*, of the Woodpecker family. The tongue is extensile and has a horny tip. The Common Wryneck (*Jynx torquilla*) visits Great Britain and the north of Europe in its spring migration. Its length is about 7 inches, and the ash-coloured plumage is marked with dark spots. The popular name refers to the snake-like motions of the bird's head and neck, and from its hiss when disturbed it is locally known as the Snake-bird.

Württemberg, a kingdom of Germany, enjoying home rule under a constitutional monarch and a Diet of two houses. It occupies an irregular area of 7,534 square miles between Bavaria on the N.E., E. and S.E. and Baden on the N.W., W. and S.W. The ranges of the Black Forest in the south-west and of the Swabian Alps in the south-east offer considerable elevations, and the latter mountains

divide the basins of the Danube and Neckar, which, with their affluents, the Iller, Enz, Kocher, and Jagst, and the Tauber, a tributary of the Main, drain the country. The valleys are very fertile, producing cereals, vines, fruits of all kinds, beet-root, potatoes, tobacco, hops, flax and hemp. Sheep, horses and cattle are numerous. Iron, coal and salt are sources of considerable wealth, and other metals are profitably worked. Mineral springs at Wildbad and elsewhere attract many visitors. Stuttgart (181,463) is the capital, and other large towns are Tübingen, the seat of the university (founded in 1477), Esslingen, Heilbronn, Ulm, Reutlingen, and Ludwigsburg. Formerly part of Swabia, the duchy was raised to a kingdom in 1806 by Napoleon, and that act was confirmed by the Congress of Vienna, when the king deserted the French at Leipzig. Pop. (1905), 2,302,179.

Würzburg, capital of the district of Lower Franconia, Bavaria, Germany, on the right bank of the Main, 57 miles N.W. of Nürnberg. One of the oldest of German cities, it contains several venerable churches, amongst them the Romanesque Cathedral, the Gothic Marienkapelle, the Neumünster, in which were buried St. Kilian, the town's patron-saint, and Walther von der Vogelweide, the minnesinger, and the church of St. Burkard. Secular buildings include the rococo Royal Palace, formerly the bishop's residence, the Julius Hospital, the Town House, and the University, founded in 1403. The manufactures comprise wine, beer, liqueurs, vinegar, tobacco, machinery, leather and railway plant. Pop. (1905), 80,327.

Wyatt, SIR THOMAS, poet, was born at Allington Castle, near Maidstone, Kent, probably in 1503, and was educated at St. John's College, Cambridge. He was in Italy in 1527 in the *suite* of Sir John Russell, the English ambassador to the Papal court, and in 1529 was appointed High Marshal of Calais. Having been a former lover of Anne Boleyn, he was implicated in her disgrace (1536) and imprisoned in the Tower, but regained Henry VIII.'s favour and was knighted in 1537. Later he was employed in delicate negotiations with Charles V. He died at Sherborne in Dorset on October 11th, 1542. His chief claim to fame rests on the fact that he was the Earl of Surrey's pioneer in introducing the sonnet into England. His son, SIR THOMAS WYATT, THE YOUNGER, was born in or about 1521. Though he was an impulsive and dissolute young man, he behaved with valour at the siege of Landrecies (1543) and in 1545 was charged with the siege of Boulogne, where he remained till its fall in 1550. The proposed marriage of Queen Mary to "the foreigner," Philip II. of Spain, offended his patriotism and he attempted to stir up a rising against it. He carried out his share in the undertaking in letter and spirit, but the other conspirators failed him. He was arrested in London at the head of a rapidly-dwindling body and beheaded on Tower Hill on April 11th, 1554.

Wycherley, WILLIAM, dramatist, was born in or about 1640 at Clive, Shropshire, and educated in France and at Queen's College, Oxford. Though

he was admitted a member of the Inner Temple in 1659, he much preferred play-writing to the Law and in 1671 produced successfully his comedy of *Love in a Wood*, followed later in the year by *The Gentleman Dancing-Master*, which failed to please. In 1672 or 1673 appeared *The Country Wife*, the lowdest and most brilliant of his plays. After the production of *The Plain Dealer* in 1674, he gave up the stage and for a while stood in favour at Court. His marriage with the Countess of Drogheda, however, provoked royal displeasure and on his wife's death his title to her estate was disputed and he was imprisoned for debts incurred in legal expenses and otherwise (1681). His circumstances became easier on his father's death (1697) and the publication of *Miscellany Poems* in 1704 led to a curious intimacy with Pope. He died in London on January 1st, 1716, and was buried in St. Paul's, Covent Garden.

Wycliffe, JOHN, Reformer, was born at Ipreswel (Hipswell), near Richmond, Yorkshire, in or about 1324 (though possibly a good deal later) and educated at Balliol College, Oxford. After holding various livings, in 1374 he was made rector of Lutterworth in Leicestershire. In 1377 he was summoned to appear before the Archbishop at London on a charge of heresy. The council, however, was broken up (not without the active assistance of Wycliffe's friend, John of Gaunt, "time-honoured Lancaster"), but Gregory XI. issued a series of bulls urging the imprisonment of Wycliffe. On the appointment of Urban VI. to the Papacy, Wycliffe became more aggressive, and advocated the abolition of the abuses in the Church, and denied the priestly power of Absolution. He began, too, his translation of the Bible. In 1380 he attacked the doctrine of Transubstantiation. A convocation bade him cease to maintain his views in the University of Oxford, and all his followers were compelled to recant. In 1384 he was struck with paralysis at Lutterworth and died on December 31st.

Wycombe, or CHEPPING WYCOMBE, or HIGH WYCOMBE, a town of Buckinghamshire, England, on the Wye, a tributary of the Thames, 29 miles W.N.W. of London. It is a place of considerable antiquity, Desborough Castle, now in a fragmentary condition, having been a Saxon stronghold. The principal buildings are the church of All Saints, the Grammar School, Guildhall, Free Library and Hospital. The manufactures include chairs, lace, flour and paper. Pop. (1901), 15,532.

Wye, or GWY, a river which rises on Plinlimmon, in Montgomeryshire, and, flowing in a mainly south-easterly direction through Radnorshire, Brecknockshire, Herefordshire, Monmouthshire and Gloucestershire, falls into the Severn, after a course of 130 miles, about 2 miles south of Chepstow, up to which point it is navigable. Rhayader, Builth, Hay, Hereford, Ross and Monmouth are on its banks. It is noted for picturesque scenery and for salmon-fishing.

Wykeham, WILLIAM OF, Bishop of Winchester, was born of humble parentage at Wickham, in

Hampshire, in 1324, and educated at the Prior's School, Winchester. He became Edward III.'s Surveyor of Works in 1356, and superintended the rebuilding of Windsor Castle. Though he had already held Church livings he was not ordained a priest till 1362. In 1366 he succeeded William of Edington as Bishop of Winchester. He was Keeper of the Privy Seal from 1361 to 1371, and Chancellor from 1367 to 1373, but, owing to the jealousy of the baronage, headed by John of Gaunt, who desired to seize the temporalities of the Church, he fell into disgrace towards the close of Edward's reign. He was restored to favour under Richard II., and in 1389-91 was a second time Chancellor. His chief care during his later years was the erection of New College, Oxford (1380-86), and Winchester College (1387-94), and the rebuilding of the nave of Winchester Cathedral (1394-1402). He died at Winchester on September 27th, 1404.

Wyoming, a western state of the American Union, bounded on the N. by Montana, on the E. by South Dakota and Nebraska, on the S. by Colorado and Utah, and on the W. by Utah, Idaho and Montana. It covers an area of 97,890 square miles. Traversed from south-east to north-west by the Rocky Mountains, it has a very rugged surface, interspersed with lofty plateaux like the Laramie Plains, 9,000 feet above sea-level. The rivers, especially in the north-west, flow through deeply-cut channels, or cañons. In this district, too, is the Yellowstone National Park, with the headwaters of the Missouri, Yellowstone, Snake, Green and other rivers. The valleys afford excellent pasture, the flocks of sheep being large and the wool-clip of great value. The chief crops are wheat, oats, maize, potatoes and hay, and the mineral resources include iron, coal, gold, copper, silver, lead, plumbago and petroleum. The capital is Cheyenne (14,087). Pop. (1900), 92,531.

X

X, the twenty-fourth letter and nineteenth consonant of the English alphabet, into which it was introduced from the Latin. Used as an initial, it has the sound of "Z," as in "Xerxes," but elsewhere it generally takes the sound of "ks." Phonetically, therefore, it may be regarded as a superfluous letter. Employed as a numeral it stands for 10; is frequently used as an abbreviation for "Christ," as in "Xmas"; is used in algebra to express the first of the unknown quantities and may be seen occasionally on brewers' barrels to indicate the strength or quality of beer.

Xaco, a name given to the llama, an animal found in the Cordilleras of Peru and Chile, by the earlier Spanish travellers. It has long ceased to be recognised.

Xanthin (from the Greek *xanthos*, "yellow"), the name of several substances, so called in reference to their colour. Amongst these may be men-

tioned (1) that part of the yellow colouring matter of flowers which is insoluble in water (that part which is soluble is known as *xanthin*); (2) the yellow principle contained in madder; and (3) a chemical body of the composition $C_5H_4N_2O_5$, related to uric acid and normally found in small quantities in the urine, liver and blood.

Xanthippe. [SOCRATES.]

Xanthoma, a somewhat rare skin disease, characterised by the formation of plates or nodosities of a yellow or yellowish-white colour embedded in the corium. In **XANTHOMA PLANUM** the lesions are generally in the form of plates, varying in size from a pin's head to a finger-nail, flat or with a slightly raised margin and so soft as to be imperceptible to the touch, as a rule. Usually it begins in the upper eyelid near the inner canthus on one side, but soon appears on the other side also, and, after extending for a time, remains stationary throughout life. "In many cases," writes Malcolm Morris in his manual of *Diseases of the Skin*, "the lower lids are affected as well as the upper, and sometimes a zone of xanthoma is formed, looking like a circle of wash-leather let into the lids." The affection, which has been met with also on the ears, nose, tongue, mouth and other parts, generally begins after the age of forty and is commoner in women than in men. Occasionally it appears to be hereditary. In severe cases excision is the only treatment. In **XANTHOMA MULTIPLIX**, ordinarily associated with jaundice, though, particularly in children, it may occur independently, the lesions are almost always nodular, the plane variety being found exceptionally. There may be a great variety in colour: a mixture of blackish pigment with the yellow has been noticed and the lesions may even have a reddish hue. Generally the eruption is widespread, beginning, as a rule, on the eyelids, though there are cases in which these have been spared, and has been noted in the mouth, throat, respiratory tract, hands and elsewhere. In the folds of the buttocks the lesions may exist in large numbers and form papules, sometimes separate, sometimes in clusters, sometimes disposed in lines, the papules varying from a millet seed to a pea or larger in size, the smaller lesions being generally soft, the larger ones firmer, more prominent and, in consequence of resting on an inflamed base, painful on pressure. Some cases are congenital, others start early in life. After progressing for a time the disease remains stationary. The distinctive feature of the lesions is that they are embedded in the corium. The only treatment is excision. In **XANTHOMA DIABETICORUM**, a rare variety, marked by a rapid evolution, speedy and complete involution, and association with diabetes mellitus, the lesions are distinguished by a raised red area around the yellow spots. The spots appear first on the extensor surfaces of the limbs and then on the lower part of the back and belly and buttocks and have been found on the palms and even, though quite exceptionally, on the eyelid. They usually disappear in a few weeks, but fresh crops may come out periodically for a while. The disease is most common in young adults, especially those inclined to obesity.

It is always associated with glycosuria, though no sugar may be found in the urine when the patient first seeks medical advice. As to how diabetes produces the lesions little or nothing is known. So far as the skin eruption is concerned the symptoms are not formidable, but it must not be forgotten that it may indicate a serious constitutional state and therefore have deep significance. The eruption will probably yield to antglycosuric treatment.

Xanthura, the specific name of the Long-tailed Blue Jay, found in Central and South America, though far from common. They are handsome birds of variegated plumage, in which the tail exceeds the wing in length. As Dr. Bowdler Sharpe has pointed out, it is unfortunate that the name *Xanthura* ("yellow-tailed") has been adopted for them, since in some the tail is blue. In fact only four species can be said to possess the yellow tail, and of these the Green Jay (*Xanthura lacunosa*) occurs in Texas and may therefore be regarded as a North American bird. The gay dress of the last-named is in obvious contrast with their plainly-feathered neighbours.

Xanthus, a city of the ancient Lycia, Asia Minor, on the Xanthus (modern, Etschen-Tchai), 8 miles from its mouth. It was memorable for two sieges. During the first under Harpagus, the general of the Persian Cyrus, the inhabitants buried themselves with all their belongings beneath the ruins of the city. In the second siege (42 B.C.) the Romans under Brutus were the aggressors and, when defeat was inevitable, the indomitable spirit of the people again asserted itself. The city was fired and the occupants perished in the flames rather than submit. Sir Charles Fellowes discovered many of its remains and described them in his *Excursion in Asia Minor* (1839). The modern name of the site is Koonik.

Xavier, FRANCISCO, the Apostle of the Indies, was the son of Juan de Jasso and was born at Xavero, near Sanguesa, Spain, on April 7th, 1506. After studying at the College of St. Barbara in Paris he became Professor of Philosophy at Beauvais and there formed a friendship with Ignatius Loyola, whom he assisted in founding the Jesuit Order. In 1541 he was sent by John III. of Portugal to preach the Gospel in India, and laboured successfully for seven years. He proceeded in 1549 to Japan, where he established a mission which continued to thrive for more than a century. He died at St. John's Island, near Canton, of malignant fever, on December 2nd, 1552.

Xenia, the capital of Greene County, Ohio, United States, on the Little Miami, 55 miles W.S.W. of Columbus. Amongst the public buildings are the court house, city hall, public library, Xenia Theological Seminary (in connection with the United Presbyterian body) and the Ohio Soldiers' and Sailors' Orphans' Home. The university founded here in 1863 for coloured students of both sexes was afterwards removed to Wilberforce, three miles to the north-east. The manufactures include paper, cordage, twine, vehicles and shoes,

and there are saw-mills, planing-mills and granite marble works. Pop. (1900), 8,696.

Xenocrates, philosopher, was born at Chalcedon on the Bosphorus, opposite Byzantium, in 396 B.C. He went to Athens and became the pupil first of Æschines and afterwards of Plato, whom he accompanied to Sicily in 361. On Plato's death (347) he associated with Aristotle and in 339 was elected rector of the Academy. In 322 he declined the citizenship of Athens as a protest against the Macedonian influence then predominant and was sold or threatened to be sold into slavery. He died in 314. He was an upright and sincere man of decided force of character, but an expounder of his master's doctrines rather than an original thinker. He insisted on the division of philosophy into three branches, namely, logic, physics, and ethics, of which the last was the greatest, since philosophy was seen at its best when it moulded and controlled conduct. Virtue was the highest good, the virtuous man being always happy and pure in deed as well as in heart.

Xenocypridina, a group of the Carp family (Cyprinidae) belonging to the order Physostomi, or fishes with the air-bladder opening into the mouth. It is characterised by an osseous ray in the dorsal fin, but the fin is short. Two of the genera occur in China, and a third is found on the west coast of Sumatra.

Xenophanes, philosopher, was born at Colophon in Ionia, a few miles north of Ephesus, about 540 B.C. He was exiled to Sicily, but finally settled at Elea, a Greek city of Lower Italy. He expounded his system of philosophy in the course of his wanderings, and died about 450. He was a Unitarian in the monotheistic rather than pantheistic sense and derided the anthropomorphic polytheism of current teachers. "There is one God, unlike mortals both in form and thought"; "Dust thou art, to dust thou returnest"; "Great is truth and it will prevail"—these were the leading points of his teaching.

Xenophon, historian and essayist, was born at Athens about 430 B.C. In 401 he was induced by his friend Proxenus of Boeotia to join the expedition of the Persian prince Cyrus against his brother, Artaxerxes Mnemon. After the Battle of Cunaxa the Greek officers were murdered and Xenophon received a military command. Eventually he found himself the leader of his ten thousand compatriots, who were endeavouring to make their way back to their native land. It was almost wholly owing to Xenophon's energy, courage and military skill that this daring scheme was successfully accomplished, the Greeks arriving at the end of five months at Trapezus (Trebizond) on the Euxine, whence they made their way to Chrysopolis, opposite Byzantium. Owing to his Spartan sympathies Xenophon was declared a public enemy by the Athenians in or about 399. Three years later he attached himself to Agesilaus, King of Sparta, and became his devoted follower, accompanying him in all his campaigns down to 387, when he settled under Lacedæmonian protection at Scillus in Elis. The period of Spartan supremacy was brought to a close by

their defeat at Leuctra (371). On the renewal of friendly relations between Athens and Sparta, the ban of exile pronounced on Xenophon was removed, but there is reason to believe that he settled in Corinth and not in his native city. The date of his death is not known, but he was alive in 357. His chief works, written with much grace and brightness, were the *Anabasis*, an account of the expedition of Cyrus, the *Cyropædia*, dealing with the youth and education of Cyrus, the *Hellenica*, a history of contemporary events in Greece, and the *Memorabilia* or, as we should say nowadays, "Reminiscences of Socrates."

Xenopterus, a genus of the group of Globe Fishes belonging to the family Gymnodontes of the Plectognathous order (fishes with their jaws united) of the sub-class Telostei, or Bony Fishes. It occurs in the Indian Archipelago and is distinguished by its funnel-shaped nostril and the small dermal ossifications, each of which has two or three roots and forms spines over the skin. *Xenopterus modestus*, about four inches long, is found in the streams of Borneo and Sumatra, while *Xenopterus naritus*, sometimes nearly a foot in length, is met with alike in rivers and the Sea of Penang. The large yellow *Xenopterus naritus* of British Burma is said to afford excellent food, though the allied genus (*Tetrodon*) from the Nile is extremely poisonous.

Xeres, or JEREZ DE LA FRONTERA, a town of the province of Cadiz, Spain, 14 miles N.E. of Cadiz. It was the *Asta Regia* of the Romans and received its present name from the Moors, who, on July 26th, 711, defeated Roderick, "the last of the Goths," on the banks of the Guadalete in the vicinity. Among the buildings are the alcazar (the Moorish castle), the municipal buildings and the collegiate church. It is famous as the headquarters of the trade in sherry, a wine which was so named after the town. Pop. (estimated), 65,000.

Xeroderma Pigmentosum, an exceedingly rare skin affection, was first described by Kaposi and is hence sometimes known as **KAPOSI'S DISEASE**. It is characterised by the formation of numerous tumours which, though seemingly benign in their early stages, take a malignant course and, after a wholesale destruction of tissues, cause death by exhaustion. In the beginning the lesions are small pigmented spots, like freckles but rather darker, which appear principally on the face, neck, arms and legs. They come and go for a time, vanishing in winter to reappear in summer, but ultimately become permanent and the colour deepens till they are often quite black. They are irregular in outline, vary from a pin's head to a pea in size, and are usually thickly crowded together, especially on the face. At first the condition suggests excessive freckling, but by and by white glazed atrophic spots appear and superficial ulcers discharging pus, which is auto-inoculable and dries into yellow crusts, beneath which healing takes place, followed by a good deal of cicatricial contraction. Lastly, after some years, small wart-looking growths develop on the freckles. "This

event," writes Sir Malcolm Morris, "marks the entrance of the disease on a more formidable phase of its evolution. Tumours form and ulcerate, producing fungous masses, the process extending both widely and deeply and destroying every tissue that comes in its way." The disease has relatively slight effect on the health until near the end, when emaciation and exhaustion set in, and a slight hæmorrhage may terminate the scene. The cause of this affection is unknown, except that exposure to the sun may be an exciting influence and special predisposition must exist. Both sexes are equally liable and the disease usually begins within the first two years of life. After the disease is fully established it tends steadily to a fatal issue, though the formation of the tumours—the sure and certain signs of inevitable mischief—may sometimes be delayed for several years. The treatment can only be palliative. Auto-inoculation of pus from the early ulcers should be prevented as far as possible and the tumours excised as soon as they are observed.

Xerodermia, the commonest form of ichthyosis (an affection characterised by dryness of the skin, which becomes scaly, rough and frequently warty), is often only a dry, scaly state of the skin. Little or no sweat is secreted and the hair follicles, especially on the extensor aspects, project on the skin, giving to the hand, when passed over it, as Sir Malcolm Morris says, in his standard work on *Diseases of the Skin*, "the feeling of a nutmeg grater." In the more marked cases, he adds, "the epidermis is distinctly thickened and the natural lines are better defined than in normal skin." The condition is congenital, as a rule, and hereditary, and both sexes are equally liable to it. It is possibly a catarrhal state. Alleviation is the line of treatment rather than attempt at direct cure. The skin should be kept soft and flexible by the free use of soft soap with warm alkaline or bran baths and vigorous friction. Anointment with lanolin or other fatty material well rubbed in should follow the cleansing process. Treatment must be persevered with steadily, else any advantage obtained in the initiatory stages will be lost.

Xerus, a genus of ground squirrel from Abyssinia and other parts of Africa. They are distinguished by their very small ears, longish limbs, and the singular texture of the hair which clothes the skin in a scanty manner and usually assumes the form of flattened spines. The animals have a slender body, pointed head and a rather long tail. They live in forest regions at considerable altitudes, and also occur in comparatively barren steppe-like areas, where they burrow in the ground under rocks, or among the roots of bushes and trees. They are diurnal in habit and feed upon herbage and buds, though they are not averse from birds, eggs and insects. *Xerus rutilans*, the best-known species, is some twenty inches in length, of which the tail claims about nine. In colour it is reddish-yellow above, becoming paler on the sides and whitish below.

Xerxes, King of Persia, succeeded his father Darius in 485 B.C. After quelling a rising in Egypt,

he turned his attention to the conquest of Greece, projected by Darius, and, collecting a motley host, in which all the various races subject to the Persian dominion were represented, set out on the expedition in 480. The little band of Spartans which, under the command of Leonidas, endeavoured to guard the pass of Thermopylæ, was annihilated after a heroic defence, and Xerxes advanced unopposed to Athens. In the narrow strait which divides Attica from the island of Salamis the Persian fleet, manned by Phœnicians, was utterly defeated by that of the Greeks (480), and Xerxes hastily retreated northwards. The conduct of the campaign was left in the hands of Mardonius, but the Greek victory at Platæa (479) completed the discomfiture of the Persians. Xerxes was assassinated in 465 by Artabanus and was succeeded by his son Artaxerxes.

Ximenes de Cisneros, FRANCISCO, Cardinal, was born at Torrelaguna, in Castile, in 1436, and educated at Alcalá de Henares, Salamanca and Rome. Having taken holy orders, he was nominated by the Pope to the archbishopric of Uzeda in Toledo in 1473. The archbishop declined to admit him and, Ximenes proving recalcitrant, put him in prison, where he remained for six years. In 1482 he entered the Franciscan order, but the fame of his sanctity and learning had spread throughout the land, and after ten years' retirement he was induced by Queen Isabella to become her confessor. In 1495 he accepted, much against his will, the archbishopric of Toledo, which was forced on him by the Pope. He acted as regent after the death of Philip in 1506, and in the following year received a cardinal's hat from Julius II. The death of Ferdinand in January, 1516, again placed him at the head of affairs, and, in spite of his great age and the opposition of the nobles, he maintained his authority unimpaired till the arrival of Charles V. He died at Roa on November 8th, 1517.

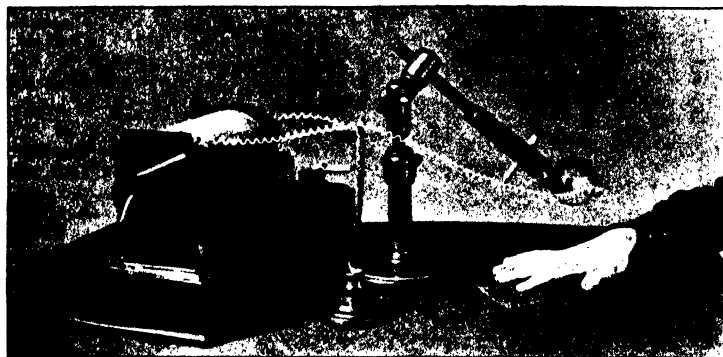
Xingu, a southern tributary of the Amazon, South America. Rising in the mountainous country of the Brazilian province of Matto Grosso (in 15° S. and 53° W.), in three head-waters, it flows in a direction mainly northwards and discharges (almost as a large lake) into the head of the Amazonian estuary, 240 miles west of Para. About 110 miles from its mouth occurs the great cataract of Itamaraca, which pours down an inclined plane for three miles before taking its final leap. Below the fall the stream becomes continuously navigable. Its total length is estimated at 1,200 miles.

Xiphiidæ. [SWORDFISH.]

Xiphocolaptes, a genus of the family of Spine-tails (*Dendrocaptidae*) belonging to the section of Mesomyiæ, or Songless Birds, of the order Passeriformes, or Perching Birds. They are Neotropical in distribution and vary in dimensions, some being as large as a fair-sized woodpecker, whilst others are very minute. The Northern Woodhewer (*Xiphocolaptes emigrans*), found in Guatemala, resembles the woodpecker in habits, clinging to the trunks of trees and rapidly climbing to the top. When

pursued, Salvin states that it takes short flights of about a hundred yards or so to another tree, alighting on it near its base and again ascending to the top, whence another flight is made.

Xiphogadus, a genus of Soft-finned Fishes (Anacanthini) belonging to a group of the family Ophidiidae, or Snake-like Fishes. It has the body naked, there is a pair of canine teeth, developed at the corners of the mouth in both the upper



METHOD OF USING X-RAYS.
(Photo: T. C. Hepworth.)

and lower jaws, and it is limited to the East Indies.

Xiphosura, a group of Arthropods, the members of which have a shield-shaped carapace or shield covering the head and thorax (or cephalothorax); the body terminates behind in a long abdominal spine or telson. The abdominal region is not marked off into two distinct regions, as in many allied animals. On the anterior part of it, which must correspond to the mesosoma, there are six pairs of limbs. The first pair of these form an operculum which protects the reproductive organs. The remaining five pairs are flat plates with a series of folds on their hinder surfaces. These act as the respiratory organs. The first pair of the appendages round the mouth are clawed. The order at the present day is represented only by the Limulus, or King-Crab, species of which occur in the seas of Malaysia and on the east coasts of America and Asia. They are of considerable geological interest, especially in the Palæozoic period. [KING-CRABS.]

Xiphydria, a genus of the Uroceridae, or Tailed Wasps, belonging to the Phytophagous tribe of the Hymenoptera. The few species which it comprises have short antennæ, a round head supported on a remarkably long neck, and five-jointed maxillary palpi. The female is equipped with an auger-like ovipositor by means of which she bores into the woody parts of trees in order that she may deposit her eggs in the hole thus formed. The larvæ of the species bore into the wood of beeches, oaks, poplars,

willows and other trees. *Xiphydria camelus*, the commonest species, is black with white spots on the top of the head and along the sides of the abdomen, and red legs, and is rather more than half an inch long.

X-Rays, or RÖNTGEN RAYS. In 1896, Professor Röntgen, of Würzburg, discovered that some invisible kind of rays are generated in the neighbourhood of a Crookes's tube, i.e., a small glass tube into each end of which is fitted a wire from some form of electric generating apparatus, when (the tube being exhausted by an air-pump) the electric circuit is broken by the vacuum sparks in the tube between the two ends of the wires. If, when an electric current is made to pass along the wires, a living human hand be interposed between the Crookes's tube and a photographic plate, a shadow photograph can be obtained which shows all the outlines and joints of the bones. These invisible rays

possess the property of passing through all bodies interposed in their path, but some bodies, being less permeable than others, cast a shadow. The discovery has proved of the greatest value in medicine and surgery.

Xylander (a Hellenised rendering of *Holtzmann*), WILHELM, scholar, was born at Augsburg, Bavaria, on December 26th, 1832. He studied at the University of Tübingen and in 1858 became Professor of Greek at Heidelberg, where he died on February 10th, 1876. He translated Dion Cassius (1558), Plutarch (1560-70), and Strabo's *Geography* (1571), also rendered into Latin several treatises of Greek mathematicians and edited Marcus Aurelius. His *Stephanos von Byzanz* was published at Basle in 1868.

Xylem, a term, formed from a Greek root with a German termination, used in vegetable histology for wood. Xylem generally originates on the inner side of a procambial strand or rudimentary stele, with the differentiation of one or a few tracheids or tracheæ, constituting the protoxylem. These are either spirally or annularly thickened. Other tracheids with pits are then differentiated from the procambium, making, with the protoxylem, the primary xylem. This may often contain also wood-parenchyma and fibres. The subsequent activity of the cambium-ring in exogenous stems gives rise to the annual rings of secondary xylem, most of the elements of which are lignified, whilst no spiral or annular vessels are present in it.

Xyleutes. [GOAT MOTH.]

Xylocopa, a genus of Carpenter Bees of the order Hymenoptera, inhabits the South of Europe and extends northwards into Germany; but though scantily represented in Europe there are over 100 species in tropical countries. The Violet Carpenter Bee (*Xylocopa violacea*) is a large insect, says W. S. Dallas, "much resembling a Humble Bee, of a black colour, with violet wings, upon which it flies noisily in the sunshine, seeking a suitable place for its nest, for which it usually selects a wooden post or the dead trunk of a tree. Having chosen a favourable position, the female sets to work with her powerful jaws, and speedily gnaws straight into the wood for a short distance, and then, turning downwards, proceeds to excavate a large tunnel in the interior of the post or tree sometimes for a distance of a foot or more. This laborious work being completed, the industrious insect collects a quantity of honey and pollen, which she deposits in the bottom of the nest. Upon this she then lays an egg and covers up the whole with a roof of concentric rings of the fine dust produced during her boring operations carefully kneaded together. This serves at once as a ceiling for the first cell and a floor for the second. Upon it a fresh supply of food is deposited, with another egg, followed by a second transverse partition, and the same processes are repeated until the whole tubular dwelling is occupied. There is some reason to think that in the warmer countries inhabited by it there are two broods of this Bee in the course of the summer." *Sapyga repanda*, one of the Aculeate Hymenoptera, haunts the nests of the Carpenter Bee.

Xylophaga. This is the name of both a genus of Mollusca and a section of Beetles. In the former it is used for a member of the class Lamellibranchiata, which bores into wood floating in or submerged beneath the sea. It is closely allied to the genus *Pholas*, which bores into soft limestones and hard clays. The section of Beetles for which the term is employed includes the Boring Beetles or Bark Beetles, which are very destructive to trees; thus *Scolytus destructor* (Oliv.) lives in the elm, *Phloeotribus oleæ* (Fabr.) in the olive.

Xylophagides, a group of Dipterous insects belonging to the Stratiomyidae of the tribe Notacantha. Its species have seven or eight free abdominal segments. The larvæ of the few genera of which it consists live in decaying wood. In the British Isles the group is principally represented by the genus *Beris*, including metallic flies of moderate size, with from four to eight spines on the scutellum—the character from which the tribe derives its name. Among the South American forms, however, species of gigantic dimensions occur, some measuring an inch and a quarter in length.

Xylophasia, a Night Moth belonging to the family Apamiidae. The Dark Arches (*Xylophasia polyodon*), one of the commonest, is brown in colour and measures nearly two inches across the wings; the abdomen is rather long and tufted at the end. The markings are not well defined, but there is a white line near the border of the fore wings, the lower portion of which forms a **W**. The

hind wings are paler and smooth and somewhat iridescent at the point where they join the fore wings. It is frequently seen at dusk and its caterpillar feeds on the roots of grasses.

Y

Y, the twenty-fifth letter of the English alphabet is sometimes a vowel, sometimes a consonant. It comes from the Greek, in which language it is equivalent to *ū*. In Latin it is used in words derived from Greek, and probably had the same sound. This was also its sound in Anglo-Saxon. Thus *lyt*, afterwards *lute*, became the *lute* of Norman French; and *hūs*, pronounced *hoos*, was the Anglo-Saxon form of "house" (*haus*). It also represents the Saxon *y*. Thus *gard* becomes *yard*; *geol*, *gule*.

Yak (*Bos grunniens*), a Tibetan ox, domesticated by the natives as a beast of burden. The wild race,



YAK.

generally brownish-black, is found near the snow-line, coming down in winter to feed on the grass in the wooded valleys. The domesticated race has white mixed with the darker colour. The size is somewhat less than that of an ox, and a long fringe of hair covers the shoulders, flanks, thighs and tail. The tail is largely used as a fly-flap.

Yakutsk, a province of Siberia, Russia-in-Asia, bounded on the N. by the Arctic Ocean, on the E. by the Primorskaya, or Littoral Province, on the S. by the Amur, Transbaikalia and Irkutsk, and on the W. by Yeniseisk. It occupies an area of 1,533,397 square miles. The western half is mainly plain country, the eastern mountainous. The chief mountains are the Stanovoi in the east and the Yablonoi, part of the southern boundary. The principal rivers are the Olenek, the Lena (the most important), Yana, Indigirka, Kolyma, and Omolon, and there are numerous others, nearly all flowing to the Arctic. Much of the surface is barren and the climate is inhospitable (the province is the coldest in Siberia), but where agriculture is practicable surprisingly good crops of rye, barley and other grains are produced and cattle reared on a very considerable scale. Gold occurs in noticeable quantities, and is the chief mineral. Yakutsk (6,534), on a feeder of the Lena, is the capital. Pop., 261,731.

Yalu, a river rising in Manchuria, the most north-easterly division of the Chinese Empire, and forming, throughout the major part of its course, the boundary between Manchuria and Korea. It has a total length of 300 miles, discharging itself into Korea Bay. It is largely employed to float timber down to the sea, but is only navigable by vessels of the dimensions of junks for some thirty miles from its mouth. The great naval battle of the war between China and Japan was fought off its mouth on September 17th, 1894, when the Japanese destroyed the Chinese fleet, and the forcing of the mouth by the Japanese was the initial incident of the land operations of the Russo-Japanese campaign of 1904-5.

Yam, the tuber of various species of the monocotyledonous genus *Dioscorea*, the type of the order Dioscoreaceæ. They sometimes reach a weight



YAM.

of 30, 40, or even 100 lbs., and closely resemble potatoes in composition and flavour, though richer in nitrogenous matter. *D. sativa*, the Common Yam of the West Indies, and *D. alata*, the Winged Yam of Polynesia, are natives of India; and *D. Batatas*, the Chinese Yam, yields large crops in France and Algeria and is hardy in England, but is not appreciated, partly owing to the depth to which its roots penetrate.

Yang-tsze-Kiang (not "Son of the Ocean," but "River of the Yang-tsze" district), the most important river in China. It is formed by the junction in 26° 30' N. and 102° E. of two rivers which have their rise in Eastern Tibet. Thence it flows with a tortuous course of 3,000 miles into the Eastern Sea at Haimun, a little to the north of Shanghai, which is situated on its vast delta. The estuary is 30 miles across, and the tide extends 520 miles, as far as the Po-Yang Lake. The highest treaty-port on the river is Chung-King (opened 1890), nearly 2,000 miles from the sea, and ships of small size can ascend half that distance. Hankow, 700 miles up, is approachable by vessels of 2,000 tons. Nanking stands at the head of the estuary. The river is in flood from May to September, and falls to its lowest in February. It carries down vast quantities of mud, which form shifting banks and islands, rendering navigation difficult.

Yapock. [OPOSSUM.]

Yard, an English measure of length containing 3 feet, or 36 inches. The standard yard, which is carefully preserved together with its authorised copies, is a bar of metal 1 inch square, consisting of a composition of 16 oz. copper, 2½ oz. tin, and 1 oz. zinc. In this bar are set two gold pins with dots marked upon them, and the distance between these dots at a temperature of 62° F. constitutes the regulation yard.

Yarkand, a town of Chinese Turkestan, Central Asia, near the left bank of the Yarkand river, 100 miles S.E. of Kashgar. It lies, surrounded by a wall and moat, at an altitude of nearly 4,000 feet above the sea. Situated in a fertile plain where live-stock raising is vigorously pursued and much grain grown, it is an important centre of distribution, besides conducting a brisk trade with Kashmir through the Karakorum Pass. Local industries are represented by the manufacture of carpets, felt, silks, linens, cottons, woollens and dyes. The principal buildings, mostly one-storey high, are mosques, Mohammedan colleges, bazaars, caravanserais and the citadel, and the streets are intersected by canals and aqueducts. Pop. estimated at from 80,000 to 100,000.

Yarmouth, GREAT, a seaport and watering-place of Norfolk, England, on the left bank of the Yare, 20 miles E. by S. of Norwich. Unknown until after the Conquest, it received a charter from King John and was fortified by Henry III. The principal buildings are the church of St. Nicholas, one of the largest parish churches in the country, the Town Hall, Free Library, Grammar School, Custom House, Aquarium, Sailors' Home, Fishermen's Institute, and Fish Market. On the front the townward side of the magnificent beach has been laid out in gardens and there are two piers, the Britannia, to the north, and the Wellington, to the south, and the old Jetty, midway between them. The North Denes contain a fine golf course and on the South Denes stands a Doric column, 144 feet high, to Lord Nelson, a Norfolk man. One curious feature of the town are the 145 narrow lanes or "rows," not unlike the "wynds" of Edinburgh, by which the chief streets of the older quarter are intersected. Owing to its remarkably pure and strong air, Yarmouth enjoys a great repute as a health and holiday resort. The outstanding industries are the fishery and curing of herring (Yarmouth "bloaters" have a world-wide fame), though mackerel, cod, turbot, sole and other fish are also dealt in. Other industries are malting, shipbuilding, and the making of ropes, cordage and fishing-nets. Pop. (1901), 51,230.

Yarmouth, or SOUTH YARMOUTH, a town of the Isle of Wight, England, the smallest parish in the island. It is situated on the Solent at the mouth of the Yare and has communication by steam ferry with Lymington on the mainland, about five miles to the north-east. The Perpendicular church of St. James contains a finely-executed statue of Sir Robertus Holmes Miles. At the west end of the town stands the dismantled fort, built in the reign of

Henry VIII. on the site of the church that had been demolished by the French. Pop. (1901), 948.

Yarrell, WILLIAM, zoologist, was born in London on June 3rd, 1784, and educated at Ealing. In 1803 he entered the business of his father, a well-known bookseller and newspaper agent in the fashionable quarter of St. James's, of which he ultimately became partner and finally sole owner. His leisure being devoted to angling and shooting, he acquired a great love for country life and its fauna, and gradually devoted much attention to the study of natural history. The better to equip himself on the zoological side he attended a course of instruction in anatomy. The results were apparent in two standard books, the *History of British Fishes* (1836) and the *History of British Birds* (1843), both admirable in respect of their accuracy and lucid and simple style. He was a frequent contributor to the *Magazine of Natural History*, founded in 1828, and to other publications dealing with various aspects of his favourite pursuits. He was elected a member of the Royal Institution in 1827, a Fellow of the Linnean Society in 1825 (afterwards becoming treasurer and vice-president), and in 1826 was made an original member of the Zoological Society. He died at Great Yarmouth on September 1st, 1856.

Yarrow, a stream of Scotland, rising in the high ground where the shires of Peebles, Dumfries and Selkirk meet. A few miles below its source it broadens into the Loch of the Lowes and then into St. Mary's Loch—the two divided by an isthmus on which stood Tibbie Shiels's far-famed inn. After leaving the latter lake it pursues a north-easterly course till it falls into the Ettrick, two miles above Selkirk, after a run of 25 miles. Although one of the smaller streams of Scotland and flowing through scenery much less romantic and less picturesque than that adorned by and adorning several other Scots rivers, the Yarrow, probably owing to the long tradition of personal association and attachment, has proved to be "the English ballad-singer's joy."

Yates, EDMUND, novelist and journalist, was born at Edinburgh on July 3rd, 1831. His father, Frederick Henry Yates (1797-1842), an esteemed comedian, had married in 1823 Elizabeth Brunton (1799-1860), an actress of standing, and it was during their tour in Edinburgh that Edmund was born. He was educated at Highgate School and Düsseldorf. Both parents being determined to keep him off the stage, he obtained a post in the Secretary's department at the General Post Office when only sixteen years old. Sir Rowland Hill apparently had some difficulty in repressing his young assistant's animal spirits, but Yates found an outlet for much of his volubility in journalism. Besides writing varied fugitive work, he acted as dramatic critic to the *Daily News* in 1854, was editor of the short-lived *Comic Times* (1855), and produced a couple of farces (*A Night at Notting Hill* and *My Friend from Leatherhead*) in 1857. The column of personal gossip written by him for Henry Vizetelly's *Illustrated Times* proving a hit, he was

chosen in 1858 to edit a newspaper called *Town Talk*. Having praised Charles Dickens fulsomely in the first number, as a set-off he libelled Thackeray in the second. Thackeray resented the imputation of time-serving, and an altercation followed which



EDMUND YATES.

ended in Yates being struck off the roll of the Garrick Club, to which he had belonged since 1848. In 1860 he became editor of *Temple Bar*, started as a rival to the *Cornhill* edited by Thackeray. He next (1867) occupied the editorial chair of *Tinsley's Magazine*, and in 1879 that of *Time*. Meanwhile he had won considerable success as a lecturer at the Egyptian Hall (1862), and on his retirement from the Post Office in 1872, on a pension of £200 a year, he undertook a lecturing tour in the United States and a post on the staff of the *New York Herald*. The duties proving too exhausting he bethought him of founding a Society paper, and the first number of *The World: a Journal for Men and Women*, appeared on July 8th, 1874. This met with remarkable success and he ultimately became sole proprietor. The venture had the drawbacks of its qualities, of course, and Yates spent a few weeks in prison in 1885 for criminal libel. He died in London on May 20th, 1894. His best independent works were his novels *Broken to Harness* (1864) and *The Black Sheep* (1867), and *Edmund Yates: his Recollections and Experiences* (1884).

Yaws, or FRAMBOESIA (French, *framboise*, a raspberry, the typical tumours bearing some resemblance to a raspberry), is defined by Sir Patrick Manson, in his *Tropical Diseases*, as "a contagious, inoculable disease characterised by an indefinite incubation period, followed usually by fever, by rheumatic-like pains, and by the appear-

ance of papules which generally develop into a fungating, encrusted, granulomatous eruption. It runs a chronic course; is mostly protective against a second attack; and, to a certain extent, is induced by mercury and potassium iodide." It is a disease distinctive of the tropical regions, very common in Africa, particularly the west coast, the West Indies, Ceylon and certain Pacific Islands, such as Fiji and Samoa, and Java. It occurs also in parts of the Malay Peninsula and, though somewhat rarely, in India and China. In Fiji the parents inoculate their children, thinking an attack more or less necessary and wholesome. West Africa seems to have been its original home, from which it was conveyed to America and the West Indies, but it would be reasonable to surmise that it must also have developed independently in some Pacific centre, since communication between the African west coast and the Far East was difficult, to say the least of it, two centuries or more ago. It is highly contagious, but contact must be very direct. A breach of the skin surface is essential, but the virus may be conveyed by insect bites, and cases frequently arise from the filthy, germ-impregnated huts in which the natives dwell. It is neither congenital nor hereditary. The great majority of cases occur in youth, males being much more liable than females, and neither race nor occupation is exempt. Whether the poison is set up by a micro-organism has not yet been established. Jonathan Hutchinson and others hold that yaws is syphilis modified by race and climate, but Sir Patrick Manson has conclusively refuted this view. After the initial fever and constitutional disturbances—persistent headache, pains in the long bones and joints, gastric trouble and diarrhoea—have declined, the characteristic eruption appears. The skin becomes harsh and dry, loses its natural gloss and very fine, light-coloured patches of peeling scales are formed, of variable shape and usually scattered irregularly over the limbs and trunk, but occasionally confluent. In the course of a few days minute papules will be seen in the patches. As the papules enlarge a yellow point appears on their summits consisting of a naked cheesy-looking substance which cannot be wiped away without obvious force. Normally the papules will either become absorbed or develop into the typical yaw tumour, varying in size from a split pea to a crown-piece, and capped (when uninjured) with a yellowish, granular, firmly adherent crust blotched with blood stains and dirt. Although during their formation there is much itching, the yaw is not sensitive and may be touched, even with acid, without causing pain. The yaw usually reaches its maximum in fourteen days, then remains stationary for a period and finally the crust shrinks, darkens and falls off. Instead of pursuing a normal course the yaw may break down and ulcerate, spreading superficially and involving deeper parts. Great physical pain ensues when a yaw forms around or under a nail, or on the sole of the foot where, imprisoned by the strong unyielding epidermis, it extends laterally and attains a large size. When the epidermis at length gives way, splitting in star-like fashion, the pressure is eased, the yaw

fungates, and relief is obtained. In healthy subjects a mild attack may last for six weeks, but in the badly-nourished the disease may run on for months, with recurrences of the eruption. In Fiji an average attack lasts a year. After the initial fever, the general health is not seriously affected during an attack, excepting that there may be a certain degree of feebleness, enlargement of the lymphatic glands, and rheumatic pains, possibly severe. In some cases the disease seems to be followed by destructive ulceration of the palate and cartilages and bones of the nose, but there is reason to believe that this rhino-pharyngitis, as it is called, is an independent disease and not a true sequela of yaws. The disease seldom proves fatal, the death-rate not being more than 3 per cent. of cases. Attention must be paid to the patient's general health by the use of nutritious food, a daily warm bath with plenty of soap, the administration of tonics and an occasional aperient, the wearing of warm clothing and the avoidance of chill. A copious eruption should be encouraged by warm, soothing drinks and (during its course) by sudorifics. After the eruption has been fully developed, mercury or potassium iodide is used, though some doctors employ them only in the later stages, while potassium iodide is often preferred to mercury, owing to the latter's liability to cause anaemia. Sometimes the yaws are touched with sulphate of copper, or nitrate of mercury or iodoform ointment is applied. Arsenic may be prescribed when the eruption is persistently squamous or papular. When the feet are attacked they should be soaked in warm water until the epidermis is softened, when it may be cut away and the underlying yaw released. Prevention being better than cure, every care must be taken to avoid and restrict contagion. Cases should be isolated, wounds and injuries in unaffected persons attended to, and the spread of germs obviated by the use of antiseptic ointments in the dressing of yaw sores, while filthy huts, the centre of disease *in esse* or *in posse*, should be burned down and the water of bathing pools must not be contaminated by yaw discharges.

Yeadon, a town of the West Riding of Yorkshire, England, on hilly country in the valley of the Aire. It is almost wholly of modern growth, having been carved out of the parish of Guiseley in 1845. The buildings are the church of St. John the Evangelist in the Early English style, and the Town Hall in the Gothic. The staple industry is the manufacture of woollen materials for mantles, ulsters, jackets and the like, and wool-combing. Pop. (1901), 7,059.

Year, the time taken by the earth to revolve round the sun, hence containing a complete cycle of the seasons. In early times it was reckoned as twelve lunar months, but this gave 354 days as the year, and the annual error of 11 days soon became so apparent that these were added on to the lunar months at various times in order to keep the year and the seasons in agreement. The Greeks added on a whole month every few years, and the Romans constantly changed their method of supplying the necessary days. Julius Cæsar, however, had the

wisdom to see that the year should be reckoned by reference to the sun and not to the moon, and the Julian year of 365 days 6 hours was henceforth adopted by the Romans and all people under their rule. In the 16th century the year was found to be 365 days 5 hours 49 minutes, and this, known as the Gregorian year, then replaced that of Cæsar. For ordinary purposes, however, the year is considered as possessing 365 days, and the extra hours etc., are allowed for by means of an extra day introduced every four years. [LEAP YEAR.]

Yeast. A large number of vegetable fungi are classified as yeasts, all of them small and microscopic organisms. The best known is that which is distinguished as *Saccharomyces cerevisiæ*. It forms small rounded or elliptic cells which multiply in saccharine and other solutions by a process of budding, a small cell forming on the side of the parent, growing and finally becoming detached. Under the influence of the yeast saccharine liquids undergo fermentation, by which they decompose with the formation of alcohol and carbonic acid, together with smaller quantities of other products. This fermentation is that on which the preparation of almost all fermented and spirituous liquors depends, and explains the use of yeast in bread-making. During the fermentation the yeast cells multiply rapidly and rise to the top of the vat or containing-vessel as a scum, which is skimmed off and known as yeast or barm. This is again used to induce fermentation in fresh liquors. The yeast cells multiply most rapidly, and hence induce fermentation most speedily, if the temperature is about 25° C. (or 77° F.), and at about 40° C. almost entirely lose this power, being killed by high temperatures. Many distilleries now do, relatively, as large a trade in yeast as in whisky. [FERMENTATION.]

Yedo. [Tokyo.]

Yell, an island of the Shetland group, Scotland, lying between Mainland and Uist, 24 miles N. of Lerwick. It is the second largest of the Shetlands, measuring about 17 miles from north to south, with a breadth varying from half a mile to six and a half miles. Yell Sound divides it from Mainland, Blue Mull Sound from Uist, and Colgrave Sound from Fetlar. The surface is bleak and barren, and reaches a height of 672 feet at its highest point. The coast line, as in the other islands, is considerably indented. It has an area of 83 square miles. Fishing is the principal industry. Pop. (1901), 2,483.

Yellow. [PIGMENTS.]

Yellow Fever, an infectious fever which prevails in some parts of the tropics, particularly in the West Indian Islands. The disease is supposed to be disseminated by mosquitoes. The latent period is usually about 6 to 10 days; there is then a sudden rise of temperature with febrile symptoms, epigastric tenderness, and vomiting; after a day or two the last-named symptoms become more marked, jaundice being present, and the vomit often begins to contain blood (black vomit). Typhoid symptoms may then supervene, and in

severe cases delirium, coma and convulsions occur. The mortality in this disease is very high, and death usually results after the lapse of three or four days. There is no active treatment, but though the fever must run its course, the condition and comfort of the patient must be closely supervised. Drugs are better avoided, but castor-oil or calomel may be useful. Every precaution must be taken against draughts, cold and chill. Solid food should not be given, but mineral water or ice will be necessary to allay the thirst.

Yellowhammer (*Emberiza citrinella*), a well-known British Bunting, generally distributed in temperate Europe. The male is a little more than six inches long, with lemon-yellow plumage marked with chestnut and black; the colours of his mate are less brilliant. In summer these birds feed chiefly on insects; in autumn on wild fruits and berries, and in winter on grain.

Yellow Sea, or WHANG-HAI, an inlet of the Pacific Ocean, off the north-eastern shores of China. It is situated between the Chinese provinces of Kiang-su and Shan-tung on the west and the peninsula of Korea on the east, and its northern areas consist of the Gulf of Pe-chi-li, the Gulf of Leao-tong and the Bay of Korea. Of numerous feelers the more important are the Peiho, Hoang-ho and the Yang-tze-kiang, the alluvium and detritus carried down by which are rendering it gradually more shallow. In the south it opens out into the Eastern Sea, or Tung-hai, and its largest island is that of Quelpart, lying towards the southern extremity of Korea.

Yellowstone Region, the region of the Yellowstone River which rises in the Rocky Mountains and flows into the Yellowstone Lake, at an altitude of 7,740 feet above the sea, and finally into the Missouri, after a total course of 1,100 miles. The Yellowstone National Park covers an area of more than 5,500 square miles, and is a pleasure-ground and preserve for indigenous animals threatened with extinction. It is remarkable for its extraordinary agglomeration of physical features. These include the Upper (110 feet) and Lower (310 feet) Falls of the Yellowstone River; the Grand Cañon, through which the river runs, 20 miles long and having precipitous rocky sides from 600 to 1,500 feet in height; extinct volcanic cones (Electric Peak, 11,155 feet, is the highest); calcareous, silicious and other hot springs (including the Mammoth) and geysers (Giant, 250 feet; Grand, 200 feet; Old Faithful, 125 to 150 feet, are the chief jets); and in the sinter terraces and elsewhere a display of coloration of exquisite beauty. The animals preserved comprise, besides others, the bison, elk, deer, bear, big-horn and cougar.

Yemen. [ARABIA.]

Yenisei, a river of Siberia, rising in the mountains of North Mongolia. After piercing the Sayan range, it pursues a north to north-westerly direction to its mouth in the Gulf of Yenisei in the Arctic Ocean. Its total length is estimated at fully 3,000 miles. It is navigable by large vessels as far as Yeniseisk and by smaller craft to Minusinsk. At

Krasnovarsk it is crossed by the Trans-Siberian Railway. Its principal feeders are the Upper Tunguska, Stony Tunguska and Lower Tunguska, all on the right.

Yeomen of the Guard, members of the bodyguard of the Sovereign. They were constituted in 1485 by Henry VII. and wear the extremely handsome and picturesque costume of that period and carry a halberd. [BEEFEATER.]

Yeovil, a town of Somerset, England, on the left bank of the Yeo, close to the border of Dorset, 40 miles S. of Bristol. The principal buildings are the fine Perpendicular church of St. John the Baptist and the Town Hall. The leading industries are glove-making (a speciality) and the making of motors and bicycles. Pop. (1901), 9,838.

Yetholm, a town of Roxburghshire, Scotland, 7½ miles S.E. of Kelso. Bowmont Water divides it into Town Yetholm and Kirk Yetholm, overshadowed by the Cheviots and not far distant from the English border. Owing to this proximity the district was frequently harried in olden days, the people, we may be sure, giving as good as they got. Tradition says that many of the slain Scots were borne hither from Flodden Field (1513) and buried in the churchyard, which was the nearest consecrated ground in their native land. But the place and locality have other and unique claims to mention, for Yetholm has been the capital of the Scottish gypsies for over two hundred years. The Egyptians, or, as they styled themselves, the "Lords and Earls of Little Egypt," first appeared in Scotland towards the end of the 15th century and long frequented various parts of the Borders, so that they might readily escape Scottish or English jurisdiction, as the case might be, before they settled at Yetholm. Here, says Sir George Douglas in his *History of the Border Counties*, they were permitted to squat by Captain David Bennet, proprietor of the barony, out of gratitude to a gypsy named Young, who had saved his life at the siege of Namur in 1695. When Bennet returned to Kirk Yetholm he built cottages for the Romany folk, and later lairds, like Nisbet of Dirleton and the Marquis of Tweeddale, continued to protect them. The community was often visited by specialists, amongst them by George Borrow and Charles Godfrey Leland (1872). The royal family among the gypsies were the Faas, who, according to the Rev. W. S. Crockett, in his fascinating book, *The Scott Country*, claimed descent from the Pharaohs and declared that Faa was only a corruption of the name. One of the most remarkable of the gypsies was Jean Gordon. She was born at Yetholm in 1670 and ducked to death, for her Jacobitism, in the river Eden at Carlisle (1746), in circumstances of disgusting brutality. Sir Walter Scott met and stood in awe of Madge Gordon, Jean's granddaughter, and it was from Madge that he drew the figure, and from Jean the character of Meg Merrilies in his novel of *Guy Mannering*. Wull Faa II., who combined sport with smuggling, died in 1847 at the age of ninety-six. His nephew, Charles I., succeeded him. He was well versed in Border lore and known to Scott, who

permitted him to camp about Abbotsford. Esther, his daughter, was queen from 1861 to 1863, and on her death there ensued an interregnum of fifteen years. Charles II., her son, was crowned in 1878. He was then over seventy and had been upright in all his doings. "He began life," writes W. S. Crockett, "as a farm servant. Later he was engaged at the construction of some of the English railways, but the nomadic instinct asserted itself and he took to hawking. After travelling the country for 35 years he settled down in Kirk Yetholm. His abode was, of course, the Palace, a neat, comfortable cottage on the village green. Great ceremonies attended his accession. Vast throngs flocked to Yetholm, with no inconsiderable gathering of his own followers and the usual gypsy retinue, caravans and asses galore. The whole affair was a clever, if somewhat ludicrous, aping of a coronation at Westminster. The 'hereditary Archbishop of Yetholm' placed the crown—a brass one studded with big imitation jewels—on his majesty's head, with these words: 'I hereby crown Charles Faa Blythe as King of the Yetholm gypsies wherever

they are, challenge who dare, and I summon all his loyal people to do him respect and homage. Long live the King!' Then the 'Chancellor' said he was commanded by his majesty to thank his subjects for the honour conferred upon him, and to say that it would be his earnest desire and endeavour to rule his people wisely and well, and he trusted that his loyal subjects in the regal villages of Kirk and Town Yetholm would live in peace and prosperity under his sway. The occasion was a unique one, and is not likely to occur again, for Scottish gipsydom is doomed." In point of fact, on the death of Charles II. in May, 1902, his people were unable to name a successor, and he was therefore the last gypsy king. Nevertheless Yetholm continues to prosper, for it has become celebrated as a summer health and holiday resort, its seclusion and pure bracing hill air being found to possess remarkable restorative properties much valued in these hustling times. Pop. (1901), 571.



CHARLOTTE MARY YONGE.

(Photo: Miss Brunston, Winchester.)

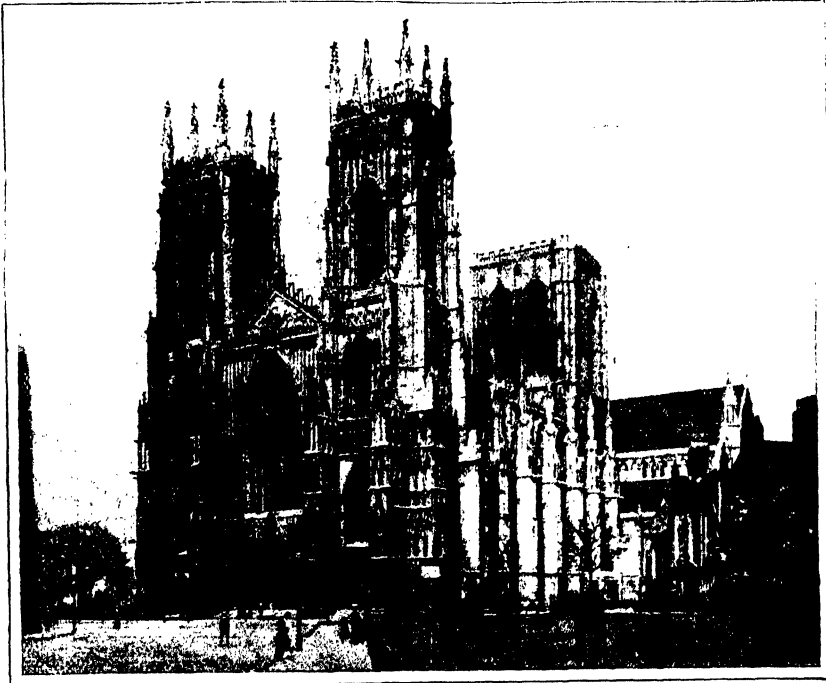
Yew (*Taxus baccata*), a gymnospermous tree of an isolated character, forming the type of the order Taxaceæ. It is a native of most temperate parts of the northern hemisphere, including Great

Britain, where many aged specimens linger in churchyards, as at Crowhurst in Sussex, where the venerable example has a girth of 27 feet at a height of four feet from the ground. It is a favourite wood for bows. Its wood is deep-brown, elastic, durable, fine-grained, and hard, most of these characters being the result of its extreme slowness of growth, which is such that some trees are probably over two thousand years old. The seeds are very poisonous.

Yezo, officially HOKKAIDO, the most northerly of the islands of Japan, separated on the south

consulates, banks and shipping companies, and containing the largest community of foreigners in Japan. The exports comprise silk and other fabrics, tea, lacquered and bamboo articles, rice, copper and other metals, and fish. Pop. (1903), 326,035.

Yonge, CHARLOTTE MARY, novelist, was born at Otterbourne, Hampshire, on August 11th, 1823. She had begun to write fiction before she was out of her teens and won remarkable success with *The Heir of Radclyffe* (1853), *Heartsease* (1854), *The Daisy Chain* (1856), *The Young Stepmother* (1861) and *The Dove in the Eagle's Nest* (1866). Of her



[Photo.]

YORK MINSTER (FROM THE SOUTH-WEST).

[Wilson, Aberdeen.

from Honshu (or Hondo) by the Strait of Tsugaru, and from Sakhalin on the north by that of La Pérouse. It has an area of 36,299 square miles and is mostly mountainous and covered with forest. Its climate is inhospitable for Japan. The minerals include coal and gold. Game abounds, and the pagan bear-festival is the great event of the year. Hakodate (85,313) is the chief port and Sapporo the capital (55,304). Pop. (1903), 843,615.

Yokohama, a treaty-port of Japan and the chief place of foreign trade, on the Bay of Tokyo, in the Island of Honshu, 18 miles S.W. of Tokyo. Established under the Elgin Treaty of 1858, it is a well-built and prosperous town, the headquarters of

graver works the best-known were *Landmarks of History*, *Camels of English History*, *Life of Bishop Patteson* and *English Church History for use in Schools*, and for thirty years she edited *The Monthly Packet*. She was an ardent Churchwoman and her strong High Church proclivities coloured her books, not to their advantage in a literary sense. But her influence otherwise was wholesome. She died at Otterbourne on March 24th, 1901.

Yonne, a central department of France, bounded on the N.E. by Aube, on the E. by Côte d'Or, on the S. by Nièvre, on the W. by Loiret, and on the N.W. by Seine-et-Marne. It occupies an area of 2,892 square miles. The surface is hilly in

the south-east and watered by the Yonne, Cure, Serein, Vanne and Loing. Wheat, oats, barley, rye, potatoes, beetroot and hay are the chief crops. Cattle, sheep, horses, pigs and goats are raised and bees are kept extensively. The principal industries are tanning, iron-founding, paper-making, brewing, distilling and the making of hosiery and boots and shoes. The red wines of Tonnerre and Auxerre and the white wines of Chablis are among the most popular in France. Auxerre (18,901) is the capital. Pop. (1901), 321,062.

York (Latin, *Eboracum*), the capital of Yorkshire, England, on the confluence of the Foss and the Ouse, 22 miles N.E. of Leeds. Originally the chief town of the Brigantes, it became the centre of Roman power in the North, and was the residence of Hadrian, Severus, Constantine and other emperors. Under the Saxons it served as the capital first of Northumbria and then of Deira. The walls, originally Roman, but restored by Edward I., still exist. The noble minster of St. Peter was founded on the site of a previous Saxon cathedral in 1171 and was finished in 1472. Next in interest comes the mitred abbey of St. Mary, whilst All Saints', St. Denis' and St. Margaret's are buildings of great antiquity. Of the old castle nothing is left but the keep—Clifford's Tower. The Guildhall dates from the 15th century. York possesses cavalry barracks, and is the headquarters of the Northern District. Modern structures are the Municipal Buildings and Courts of Justice. The industries include iron-founding, engineering, glass-making, brewing, tanning, and glove-making and railway works. Pop. (1901), 77,914.

Yorke, PHILIP, 1st Earl of Hardwicke, Lord Chancellor, was born at Dover on December 1st, 1690, and educated at a private school in Bethnal Green, London. He was placed in a solicitor's office and afterwards studied at the Middle Temple, being called to the bar in 1715. (In 1724 he was admitted a member of Lincoln's Inn, of which he became a bencher and treasurer in the same year.) In 1719 he was elected M.P. for Lewes and in 1722 for Seaford, which he represented as long as he was a commoner. Already Recorder of Dover, he became Solicitor-General in 1720, with the customary knighthood, and Attorney-General in 1721. As law officer for the Crown he conducted his cases with a quiet dignity and moderation that were in happy contrast with the zeal and bluster of his predecessors. In 1733 he was appointed Lord Chief Justice, being raised to the peerage as Baron Hardwicke of Hardwicke in Gloucestershire, and, four years later, Lord Chancellor. He took an unostentatious though none the less real part in the framing of Government measures and his was the iron hand in the velvet glove of successive administrations. Since his advance to the highest post he had developed an excessive regard for law and order. Had he had his will he would have punished Edinburgh with ridiculous severity for the Porteous mob, and the most tyrannical features of the legislation directed against the Jacobites after Culloden (1746) were inspired by him, such as the prohibition of the wearing of the Highland garb, the declaring

the order of the Scottish nonjuring episcopal clergy invalid and the annexation to the Crown in perpetuity of the forfeited estates. He carried a reform of the Marriage Laws (1753) which dealt with clandestine marriages, in 1754 was promoted to the earldom and two years afterwards resigned office. Though he continued to interest himself in politics he resolutely declined to resume any post in any Administration, and died in London on March 6th, 1764. He was one of the great lawyers of England and gradually revolutionised the procedure of the Court of Equity. In the legal circles of a later day the Hardwicke Society perpetuates his memory. His second son, CHARLES YORKE (1722-70), became Lord Chancellor in 1770, a few days before his death, which was ascribed by some to suicide consequent on the reproaches hurled at him for the desertion of his party, but which most people, more charitably and probably more correctly, accounted for by the extreme nervous tension and anxiety he had undoubtedly gone through in connection with his accession to office. The patent of nobility was brought to him on his death-bed, but he forbade its authentication under the Great Seal, which he "hoped was no longer in his custody."

Yorkshire, the largest of the counties of England, has an area of 5,938 square miles, being bounded on the N. by Durham, on the E. by the North Sea, on the S. by the Humber, Lincoln, Nottinghamshire and Derbyshire, on the W. by Derbyshire, Cheshire and Lancashire and on the N.W. by Westmorland. It is divided into the East, West and North Ridings (Riding = Trithling or third), each of which has peculiar characteristics. The East Riding (1,187 square miles), bounded on the N. by the Derwent, on the W. by the Ouse, and on the S. by the Humber, is mainly agricultural, growing wheat, barley, turnips, beans and hay. There are ironworks at Beverley and Hull, and the latter is the chief centre of shipping with the Baltic. The West Riding (2,627 square miles) is the greatest manufacturing district in the world, containing between the Aire and the Don a great coalfield, about which cluster the extremely important towns of Leeds, Bradford, Halifax, Dewsbury, Huddersfield and Sheffield. Agriculture prospers also to the north and east of this division, and in the north-west are wide pastures and great dairy farms. The North Riding (2,124 square miles) is for the most part a pastoral country, being cut off from the East Riding by the Derwent and Rye, from the West Riding by the Ouse and Ure, and from Durham by the Tees. Iron is worked extensively at Middlesbrough, which is a thriving seaport. Lead, limestone, alum and jet are sources of considerable profit. The county is noted for its watering-places, Scarborough, Whitby, Bridlington Quay, Filey, Saltburn and Redcar being the most famous. York is the capital. Pop. (1901), of the administrative county, 1,891,766; of the ancient county, 3,585,122.

Yorktown, capital of York county, Virginia, United States, on the right bank of the York, 10 miles from its mouth on the Atlantic and 60 miles E.S.E.

of Richmond. It has played a unique part in the history of the Union. Besieged by George Washington and the Viscount de Rochambeau, whose operations were aided by the co-operation of the French fleet under Admiral de Grasse, the British forces under Lord Cornwallis surrendered on October 19th, 1781, and thus practically terminated the American struggle for independence. During the Civil War it was strengthened by the Confederates, but was evacuated on May 4th, 1862, under pressure from General G. B. McClellan.

Yorubas, a Negro people of West Africa, occupying nearly the whole of the region on the Slave Coast between Badagry and the Benue river west and east, and extending inland to about 8° N. The chief divisions are Egbas (capital, Abeokuta), Ketu towards the Dahomey frontier, Jebus about Lagos, Ibadans east of the Egbas, Ondos, Ileshas, and Ilorins towards the eastern frontier, and the Yorubas proper in the extreme north, whose empire (capital, Oyo) was overthrown early in the 19th century by the Mohammedan Fulahs. Since then the Yorubas have been broken into a number of petty states either warring with the Dahomans or at strife amongst themselves till 1890-2, when the whole nation accepted the British protectorate. The Yorubas are an extremely intelligent agricultural and trading people.

Yosemite Valley, a glen in the Sierra Nevada, California, United States, 180 miles E. by S.



"EL CAPITAN," YOSEMITE VALLEY.

(Photo supplied by the Southern Pacific Railway.)

240C—N.E.

of San Francisco. It is traversed by the Merced, a righthand tributary of the San Joaquin, is about eight miles long and from half a mile to two miles wide. The remarkable physical features are the result of glaciation on the largest scale. Amongst the grandest features may be named the Cathedral Rocks (8,831 feet above the sea), Sentinel Dome (8,205 feet), Glacier Point (7,292 feet) and El Capitan (7,012 feet); the Yosemite Falls, which in three leaps (Upper Fall, 1,436 feet vertical; Middle Fall, 626 feet; Lower Fall, 400 feet) drop half a mile, and the Bridal Veil Fall (630 feet); and Mirror Lake, celebrated for the beauty and magnificence of its reflections. Much of the valley is park-like and amongst the trees are examples of the mammoth Sequoia. Yosemite, an Indian word meaning "great grizzly bear," is pronounced in four syllables with the accent on the second and the "i" and final "e" short—Yo-sém-it-eh.

Youghal (pronounced "Yawl"), a seaport of County Cork, Ireland, on the western shore of the



SIR WALTER RALEIGH'S HOUSE, YOUGHAL.

estuary of the Blackwater, 30 miles E. of Cork. It is one of the oldest towns in the island, being the Vodium of Ptolemy. The Norwegians appear to have established a port here during the 9th century, and 300 years later it was colonised by Anglo-Normans from Bristol and received a charter in 1209 from King John. The Franciscan monastery founded by Fitzgerald in 1224 was the first house of that Order in Ireland. The town was pillaged by the Earl of Desmond in 1579, was defended by the Earl of Cork in 1641 for Charles I. and eight years afterwards, when Cromwell had his winter quarters there, declared for the Parliament. Youghal is associated with Sir Walter Raleigh, who was mayor in 1588 and 1589 and whose house, Myrtle Grove, still remains pretty much as he left it. In its grounds he is said to have planted the first potatoes in Ireland and has thus a twofold claim to be considered a benefactor of the Old World. The principal buildings are the church of St. Mary in the Later Decorated, the Clock Gate, the Custom House, the Session House and the Bridewell. Apart from the shipping, which is the staple trade of the town, there are manufactures of earthenware and bricks and a salmon fishery. Youghal is in growing repute as a holiday resort. Pop. (1901), 5,915.

Young, ANDREW, poet and schoolmaster, was born at Edinburgh on April 23rd, 1807, and passed through the arts and divinity curricula at the University brilliantly, gaining "Christopher North's" prize for a poem on "The Scottish Highlands." Appointed teacher of Niddrie Street school in his native city in 1830, he left it eleven years afterwards, the number of pupils having grown in the interval from eighty to six hundred. In 1838 he published the hymn "There is a happy land," which should gain him immortality, though probably not one person in a million knows its author's name. The words were written to an Indian air he heard one night on the piano. In 1840 he became English master at Madras College in St. Andrews, returned to Edinburgh in 1853 and spent the remainder of his days in philanthropic work and as superintendent of Greenside parish Sunday school. He died in Edinburgh on November 30th, 1889.

Young, ARTHUR, agriculturist, was born in London on September 11th, 1741, and educated at Lavenham. He was intended for a commercial career, but this was abandoned on his father's death in 1759 and he ultimately took to farming at Bradfield in Suffolk and elsewhere. By constant experiment with seeds and soils he acquired a thorough knowledge of the theory and practice of agriculture and became the chief authority of his day on the subject. He made several tours in England, Ireland and France, in which he devoted attention especially to the condition of cultivation in each country. Writing a brisk, bright style and endowed with the gift of keen observation, his account of these various tours became very popular, his *Travels in France* (1792) being historically valuable, in consequence of his description of the contributing causes of the French Revolution, of the earlier stages of which he was an eye-witness. In 1793 the Board of Agriculture was created and Young was appointed its first secretary. He died in London on April 20th, 1820.

Young, BRIGHAM. [MORMONS.]

Young, CHARLES MAYNE, actor, was born in London on January 10th, 1777, and was educated at Eton and the Merchant Taylors' School. His father, a surgeon of some note, seems to have been a dissolute brute and eventually the whole family had to seek the hospitality of a sister of Charles's mother. After playing as an amateur he took to the stage professionally and made his *début* at Liverpool in 1798 under an assumed name, but soon afterwards appeared at Manchester under his own name. He was a successful actor almost from the first and in 1802 played at Edinburgh throughout the whole season. He acquired the friendship of Sir Walter Scott, with whom he sometimes stayed. In 1805 he married Julia Ann Grimani and lost her sixteen months later. Young made his first appearance in London at the Haymarket on June 22nd, 1807, playing "Hamlet" with great acceptance. His repertory was varied both in comedy and tragedy, and he was popular in the provinces and metropolis alike. He joined John Philip Kemble's

Covent Garden company in 1808 and, Kemble seldom appearing, was recognised as the leading tragedian until Edmund Kean and William Charles Macready disputed his position. He did not appear at Drury Lane till 1822, where he divided the "lead" with Kean, whom he supported as "Iago." He retired early from the stage, pleading as his reasons failing health and a desire to be remembered when at his best. He took his farewell (January 31st, 1832) as "Hamlet," Macready playing the "Ghost" and the elder Mathews "Polonius." Young died at Brighton on June 28th, 1856. He was a highly respected man, of blameless life. He excelled in mournful and melancholy parts, in which his musical voice had ample scope, but was also seen to advantage in parts demanding *hauteur*, declamation and the ascription of indignant patriotism. "I tell you what," said Kean, "Young is not only an actor such as I did not dream him to have been, but he is a gentleman." He had to bear comparison with J. P. Kemble, Kean and Macready, and bore it creditably.

Young, EDWARD, poet, was born at Upham, near Winchester, in 1683, and educated at Winchester and New and Corpus Christi Colleges, Oxford. After writing some fugitive verse he produced at Drury Lane two tragedies, *Iustiris* (1719) and *The Revenge* (1721), neither of which had any success. These were followed, between 1725 and 1728, by *The Universal Passion*, a series of satires of considerable merit. In 1730 he took holy orders and was presented to the rectory of Welwyn in Hertfordshire. Between 1742 and 1745 appeared his only great work, *The Complaint; or, Night Thoughts on Life, Death and Immortality*, which gained immediate popularity. He died at Welwyn on April 5th, 1765.

Young, SIR GEORGE, LORD, Judge, was born in 1819 at Rosefield, Kirkcudbrightshire, Scotland, and educated at Dumfries Academy and Edinburgh University. Called to the Scottish Bar in 1840, he then began a long career of uninterrupted and unqualified success in his profession. From 1853 to 1860 he was Sheriff of Inverness-shire; Sheriff of Haddington and Berwick from 1860 to 1862; Solicitor-General for Scotland from 1862 to 1866 and 1868-9; M.P. for the Wigtown Burghs from 1865 to 1874; and Lord Advocate from 1869 to 1874. In the last year he became a Judge of the Court of Session under the designation of Lord Young, and held this appointment till his resignation in 1905, a period of 31 years. He was noted for his skill and promptitude in getting at the heart of a case and his impatience of red-tape and convention. It was a rare tribute to his legal attainments and mental powers that he was in 1869 called by special resolution to the English Bar, and was afterwards elected a Bencher of the Middle Temple. In the House of Commons his chief work was done in connection with the Scots Education Act of 1872. He was known for his caustic and witty sayings. When told that the House of Lords had, on appeal, affirmed one of his decisions, he remarked keenly, "It may be right for all that." He was the last link with Robert Burns, Dr. Maxwell, who attended

the poet in his final illness, having been a friend of his youth, when, too, he often enjoyed the hospitality of Burns's widow (Jean Armour). He died in London on May 23rd, 1907.

Young, JAMES, founder of the paraffin industry, was born at Glasgow on July 13th, 1811. His father, a joiner, gave him what education he could whilst working at the bench. James attended the evening classes of Thomas Graham, the chemist, at the Andersonian University in 1830, and in the session of 1831-2 was made Graham's assistant. After carrying out some experimental work in London (1837), he became manager to Messrs. Muspratt, the alkali manufacturers at Newton-le-Willows (1839), and afterwards (1844) to Messrs. Tennant, at Manchester, being instrumental during his stay in the latter city in founding the *Manchester Examiner*. In 1848 he bought (along with Edward Meldrum) the yield of a petroleum spring at Alfreton in Derbyshire, from which the firm made illuminating and lubricating oils. The spring giving signs of exhaustion, Young experimented on the production of paraffin from the dry distillation of coal and took out a patent for his process in 1850 and 1851, having discovered in the Torbane Hill mineral or Boghead coal of Linlithgowshire the very material he was in need of. In partnership with his friend Meldrum and Edward William Binney he opened works at Bathgate in 1852 and thus founded the paraffin industry which has attained to vast dimensions in various countries. At first the firm made naphtha and lubricants and afterwards paraffin, liquid and solid. In 1865 Young took over the whole business, built second and larger works at Addiewell, near West Calder, and sold his interest for £400,000 to the Young's Paraffin Light and Mineral Oil Company. In 1873 he was elected Fellow of the Royal Society. He died at Kelly on the Clyde, near Wemyss Bay, on May 13th, 1883. He was a generous friend to David Livingstone, whom he had known ever since the Andersonian night classes. When the explorer was in Africa he was free to draw to any extent on Young, who also subscribed £1,000 towards the Zambesi Expedition and £2,000 towards the Search Expedition. He was the donor of the statues of Graham and Livingstone in George Square, Glasgow, and endowed (in 1870) the Young Technical Chemistry Chair in Anderson's College in that city with £10,000.

Young, THOMAS, physician, physicist, and Egyptologist, was born at Milverton, Somerset, England, on June 13th, 1773. He was a boy of remarkable precocity, exhibiting equal proficiency in the classics, mathematics, science, Oriental languages and practical mechanics (including the making of optical instruments), and was educated at Compton in Dorset and privately at home. In 1792 he proceeded to London to study medicine at St. Bartholomew's Hospital, and had barely attained his majority when he was elected a Fellow of the Royal Society for his paper on the accommodating power of the eye, which he proved to be due to change of curvature of the crystalline lens. He next removed to Edinburgh to attend medical classes there, and then went to Göttingen with

similar intent. He next entered Emmanuel College, Cambridge (1797), where he was known as "Phenomenon Young." In 1799 he set up practice in London and continued his medical career actively till 1814, when he retired. From July 1801 to July 1803 he acted as Professor of Natural Philosophy at the Royal Institution, in 1802 was appointed Foreign Secretary of the Royal Society, and in 1808 graduated M.D. at Cambridge. He was elected a Fellow of the College of Physicians in 1809 and Croonian Lecturer in 1822 and 1823, and held several hospital appointments. As a lecturer he was rather a failure, his matter being so condensed as to be above the heads of his students and general hearers. In 1818 he was made superintendent of the *Nautical Almanac* and Secretary to the Board of Longitude, becoming adviser to the Admiralty on the dissolution of the Board in 1828. In the previous year he had been elected one of the eight foreign members of the French Academy of Sciences. He died in London on May 10th, 1829. One of the most versatile men of science, Young has been well styled the founder of physiological optics. He was the first to describe astigmatism and explain colour sensation and colour blindness. In professional work he clearly stated the laws regulating the flow of blood through the body, and reviewed all that was known of consumptive diseases. He supported the wave theory of light and enunciated his famous doctrine of interference in a paper "On the Theory of Light and Colour" (1801). His fertility of suggestion in the field of optics led, in other hands, to the theories of double refraction, dispersion for absorbent media and polarisation. Independently (1805) of Laplace he stated non-mathematically the theory of capillary action, was the first to employ the word "energy" for the product of the mass of a body into the square of its velocity, and the term "labour expended" for the product of the force exerted on a body into the distance through which it is moved, and introduced absolute measurements in elasticity by defining Young's modulus. His contributions to Egyptology were equally valuable, as he was one of the earliest to establish the correct system of interpreting the hieroglyphic inscriptions on Egyptian monuments and remains.

Youngstown, capital of Mahoning county, Ohio, United States, on the left bank of the Mahoning, 66 miles E.S.E. of Cleveland. The principal structures are the Federal building, the Reuben McMillan Library, and several charitable and educational institutions. It has extensive iron and steel works, foundries and machine shops, and amongst its manufactures are vehicles, motor-cars, powder and lumber products. Pop. (1900), 44,885.

Ypres, a town of the province of West Flanders, Belgium, on the Yperlee, 30 miles S.S.W. of Bruges. It was a flourishing city in the Middle Ages, and many of its ancient picturesque buildings having been carefully preserved, it still has an air of distinction and is interesting on that account. Amongst the more remarkable edifices are the Transition church of St. Martin, with a beautiful

rose window; the superb Cloth Hall (Halle des Drapiers), with a façade 462 feet long, interrupted in the centre with an imposing belfry, and carrying in its niches the statues of 44 Counts of Flanders; the 18th-century Hôtel Merghelynck, containing a museum of furniture; the Renaissance Town Hall; the Belle Asylum for aged women, founded in 1621 by the Belle family, and the Antiquarian Museum and Picture Gallery. The manufactures comprise cotton and linen, thread and lace. Pop., 17,265.

Ythan, a river of Aberdeenshire, Scot'and, rising at the Wells of Ythan, about 2 miles N. of Tillymorgan Hill. It flows in a north-easterly direction as far as Towie Castle, and then pursues in the main a south-easterly course to the North Sea, into which it discharges itself twelve miles north by east of Aberdeen, after a total run of 35 miles. The places of interest on its banks are Logie Buchan, Ellon, the former capital of Buchan, Methlick, Gight Castle (which belonged to Lord Byron and near which was "the mill of Tifty's Annie"), and Auchterless. The stream abounds with salmon and trout, and pearls are found in its waters. It is said that the great pearl in the Scottish crown came from the Ythan.

Yucatan, a peninsula forming the southern horn of the Gulf of Mexico and comprising the Mexican states of Campeche (18,087 square miles) and Yucatan (35,203 square miles). The Yucatan Channel separates it from Cuba. It is a porous limestone plateau, partially of coral formation, of a general elevation of 200 feet. It has forests of mahogany, logwood and other trees economically valuable in industries and medicine, and its chief agricultural product is Sisal hemp, or hennequen, an important fibre, which is not hemp, however, but obtained from an aloe (*Agave Sisalensis*). Yucatan state contains numerous remains of the Mayas, who occupied the land at and before the Spanish conquest. These ruins indicate a civilisation higher than that even of the Aztecs of Mexico and the Incas of Peru. Merida (43,630), the capital, is 26 miles S. of Progreso, its port on the Gulf of Campeche. Pop. of Yucatan state (1900), 314,087; of Campeche, 86,542.

Yucca, a genus of Liliaceæ, occurring in the Southern United States, Mexico, and Central America. They are commonly arborescent, having a pericycle in which new fibro-vascular bundles originate in old stems. Their leaves are in a crown, rigid, linear-lanceolate, and acute, from which they have acquired the popular name of Adam's Needle.

Yukaghirs. [YUKAGIRS.]

Yukon, a province of Canada, North America, bounded on the N. by the Arctic Ocean, on the E. by the province of Mackenzie, on the S. by British Columbia and on the W. by Alaska. It occupies an area of 196,976 square miles. The surface is mostly mountainous, amongst the highest points being Mount Logan (19,500 feet) and Mount Augusta (14,900) near the Alaskan frontier, and Mount Lorne (6,400) west and Mount Michie (5,500) east of Lake Marsh. The Yukon is the

principal river, the most important of its affluents being, on the right, the Porcupine, Stewart, Pelly, Big Salmon, Little Salmon, Teslin or Hootalinqua and, on the left, the White and Klondike. The country is extensively wooded almost throughout its whole area, and wheat, oats and barley, as well as vegetables, grow in the more favoured localities. Gold is the leading mineral, the Klondike diggings being famous. Dawson (9,142) is the judicial seat. The province is administered by a Commissioner and an Executive Council of ten members, of whom half are popularly elected. Pop. (1901), 27,219.

Yule, SIR HENRY, geographer, was born at Inveresk, Edinburghshire, on May 1st, 1820, and educated at the Royal High School of Edinburgh, Addiscombe College and Chatham. In 1840 he entered the Bengal Engineers and was engaged in developing the irrigation system of the North-West Provinces. After the two Sikh wars, in both of which he took part, he was appointed (1855) under-secretary to the new Public Works department, but was allowed to act as secretary to Phayre's embassy to Burma, of which he wrote an account in *A Narrative of the Mission to Ava in 1855*. After his retirement (1862) he devoted himself mainly to geographical literature and acquired great distinction by his edition of *The Book of Ser Marco Polo* (1871) and his *Hobson Jobson, a Glossary of Anglo-Indian Colloquial Words and Phrases* (1886). He was created K.C.S.I. in 1889 and died in London on December 30th in that year.

Yunnan, the most south-westerly province of China, bounded on the N. and E. by the Chinese provinces of Szechwan, Kweichow and Kwangsi, on the S. by Tongking, the Shan States and Burma, and on the W. by Tibet. It occupies an area of 146,680 square miles. The surface is mountainous and watered by the Salwin, Yang-tsze-Kiang, Me-Kong and other rivers. The mineral wealth is great, comprising gold, silver, lead, copper, tin and coal. Tea of excellent quality is produced in certain parts, and agriculture and live-stock raising are flourishing pursuits. Yunnan (150,000) is the capital. Pop., 12,324,574.

Yverdon, a town of Vaud canton, Switzerland, on the Toile (Thiele), near its entrance into the Lake of Neuchâtel, 18 miles N. of Lausanne. It is a place of considerable antiquity, being the Eburodunum of the Romans. The castle, erected in 1135 by Duke Conrad of Zähringen, accommodated Pestalozzi's school from 1805 to 1825, and is now occupied by the town school. The principal buildings are the Town Hall, Museum of Antiquities (including Celtic and Roman remains) and the Library. It has railway factories, iron-foundries and distilleries. The sulphur springs attract many patients to the baths. Pop., 8,000.

Yvetot, a town of the department of Seine-Inférieure, France, 20 miles N.W. of Rouen. Arising out of a jest of Henri IV., the lords of the manor styled themselves kings until the title was formally suppressed towards the end of the 17th century. Béranger's satire on Napoleon, "Le Roi

d'Yvetot," is familiar to English readers in W. M. Thackeray's translation. The town has manufactures of cotton and linen fabrics, and nursery gardening, and is an important agricultural centre. Pop. (1901), 7,352.

Z

Z, the last letter of the English alphabet, was the sixth letter in the Greek alphabet, in which it had the sound of *ts* or *ds*. In Italian it still has this force, and is sometimes doubled, and represents the Latin *di* or *ti*. *Z* was introduced into Latin in the time of Cicero, and was apparently confined to words derived from Greek. In German it sounds as *ts*, in Spanish as *th*.

Zaandam, a town in the province of North Holland, the Netherlands, on the Zaan at its entrance into the Y, 5 miles N.W. of Amsterdam. It is a bright and clean place, has flour, saw and oil mills, and carries on manufactures of tobacco, paper, starch and glue, besides shipbuilding. The hut occupied by Peter the Great whilst working here as a ship's-carpenter still stands. Pop. (1900), 21,600.

Zabern (French, SAVERNE; Latin, TRES TABERNÆ), a town of Alsace, Germany, on the Zorn, a left-hand tributary of the Rhine, 22 miles N.W. of Strasburg. One of the passes over the Vosges Mountains is in the vicinity. There are manufactures of leather, grindstones and agricultural implements. Pop. (1900), 8,500.

Zacatecas, a state of Mexico, bounded on the N. by Coahuila, on the E. by San Luis Potosi, on the S. by Aguas Calientes and Jalisco, and on the W. by Durango. It occupies an area of 24,757 square miles. The surface is mostly mountainous, having an average height of 7,000 feet above sea level. The chief rivers are the Rio Grande de Santiago, or Lerma, Tlatenango and Juchipila. Wheat, maize, peaches, apricots, grapes and vegetables are cultivated in the fertile land, but most of the soil is barren. Its mineral resources constitute the wealth of the state, which in this respect is the most important in Mexico. It is particularly rich in silver, but gold, copper, lead and quicksilver also occur. Zacatecas (39,112), the capital, has a cathedral, municipal palace, mint, the Colegio de Nuestra Señora de Guadalupe and other educational and charitable institutions, and manufactures of pottery. Pop. of state (1900), 462,190.

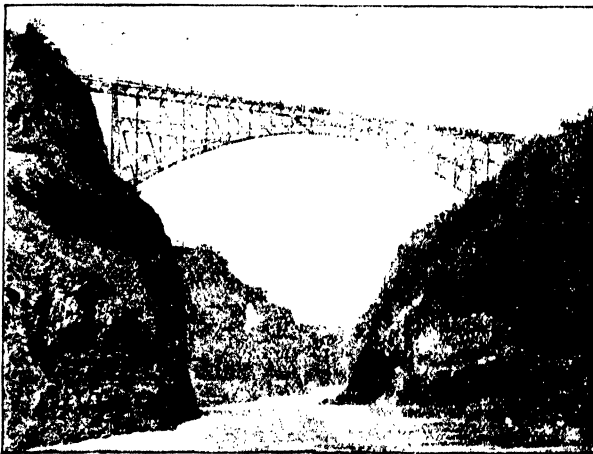
Zagazig, a town of the province of Charkieh, Lower Egypt, 40 miles N.E. of Cairo. It is situated on the Muiz Canal, and is one of the towns in the Delta. It is an important distributing centre, with

a large trade in cotton and grain. Cotton-spinning and agriculture are carried on. The town was occupied by the Indian Contingent under Major-General Macpherson immediately after the battle of Tel-el-Kebir (September 13th, 1882). The site of the ancient Bubastis, the seat of the worship of the goddess Bast, to whom the cat was sacred, is in the neighbourhood. Pop., 35,715.

Zaire. [CONGO.]

Zambales, a province on the west coast of Luzon, an island of the Philippines, a Pacific possession of the United States. The Gulf of Lingayen lies to the north-east and Subig Bay to the south. It has an area of 2,125 square miles. The surface on the eastern boundary is hilly, reaching in Negron a height of 1,000 feet. Sugar-cane, grain, indigo, cacao and rice are the principal products. Iba (3,512), on the coast, 80 miles N.W. of Manila, is the capital. Pop., 104,550.

Zambesi, the fourth largest river of Africa, rises in the extreme east of Portuguese West Africa, in 11° 21' S. and 24° 22' E. After describing a vast curve as it sweeps between Northern and Southern Rhodesia and another curve as it flows through Portuguese Zambesia, it falls into the Indian Ocean by several mouths, of which Chinde is the chief. Its total length is estimated at 2,000 miles and its catchment area at 513,000 square miles. The principal tributaries are the Kwando, on the right,



CAPE-TO-CAIRO RAILWAY BRIDGE ACROSS THE ZAMBESI.

and the Kafukwe, Loangwa and Shiré on the left. Soon after reaching Rhodesia it is precipitated over the magnificent Victoria Falls, near which it is crossed by the Cape-to-Cairo railway. The river is navigable as far up as the Kebrabasa rapids, 400 miles from the sea, and from above these for a distance of 800 miles by boats of shallow draught.

Zamboanga, a province in the west of the island of Mindanao, of the Philippine group, a

Pacific possession of the United States. Its western shores are washed by the Sulu Sea, and the Strait of Basilan separates it from the island of that name. Its coastline is considerably indented, especially in the south by the noble Bay of Sibuguey. It occupies an area of 3,056 square miles. The interior surface is mountainous and inhabited by Moros, a race of Mohammedan Malays. The province is the main supply of vegetables for the islands. Hemp and guttapercha are exported. Zamboanga (18,000), in the extreme south, is the chief town. Pop., 44,322.

Zamora, a province of Spain, bounded on the N. by Leon, on the E. by Valladolid, on the S. by Salamanca, on the W. by the Portuguese province of Tras-os-Montes, and on the N.W. by Orense. It covers an area of 4,097 square miles. Spurs of the Cantabrian Mountains penetrate the province in the north-west, but the surface on the whole is level. The chief rivers are the Douro (which traverses it from east to west) and its affluents the Valderaduey and Esla (on the right) and the Guareña (on the left). Wheat, rye, barley, oats, maize and pulse are largely raised, and merino sheep occupy the higher ground. Wine, olives and flax are the leading products. The industries are unimportant and the mineral wealth is undeveloped. Zamora (16,417), on the right bank of the Douro, is the capital. Pop. (1900), 275,545.

Zamouse (*Bos brachyceros*), a buffalo from Western Africa, occurring principally in Sierra Leone, possibly only a variety of the Cape buffalo. It has ears fringed with hair, short horns depressed at the base and no dewlap.

Zanesville, the capital of Muskingum county, Ohio, United States, on the Muskingum, 59 miles E. of Columbus. The public buildings include the Court House, Zanesville Athenaeum and the Sailors' Memorial Hall. There are manufactures of pottery, glass, bricks and tiles, flour, soap, candles, iron and steel, engines, machinery and agricultural implements. Pop. (1900), 23,538.

Zangwill, ISRAEL, man of letters, was born in London in 1864 and practically self-educated, taking the B.A. with honours of London University. After spending a few years as a teacher he became a journalist and finally took to fiction and the drama. His chief novels are *Children of the Ghetto* (1892), *Ghetto Tragedies* (1895), *The King of Schvazzers* (1894), *The Master* (1895), *Dreamers of the Ghetto* (1898), *They That Walk in Darkness* (1899), *The Mantle of Elijah* (1900) and *The Grey Wig* (1903). His plays include *Six Persons* (1892), *Children of the Ghetto* (1899), *The Moment of Death* (1900), *The Revolted Daughter* (1901), *Mercy Mary Ann* (1903), *The Serio-Comic Governess* (1904), *Jenny the Carrier* (1905) and *Nurse Marjorie* (1906). He is President of the International Jewish Territorial Organization and a strong supporter of Zionism, as the movement is called which is characterised by a widespread revival of the national spirit of the Jews.

Zante, or ZANTHE (the Greek ZACYNTHUS), one of the Ionian islands, in the Mediterranean,

belonging to Greece. It has a trend from north-west to south-east, is 25 miles long, 12 miles broad, has a coastline of 64 miles and occupies an area of 277 square miles. It lies 10 miles S. of Cephalonia and is 16 miles from the nearest point of the mainland (the Morea). The surface consists mainly of a fertile central plain, flanked both on the east and west by hills which, in Mount Skopos, reach an elevation of 1,500 feet. The eminences are pleasantly covered with olives, figs, myrtles, laurels, vines, oranges and other sub-tropical vegetation. The principal products are currants, the fruit of a dwarf vine, wine, made from a grape of agreeable bitter-sweet taste, olives, oranges and lemons. The climate is healthy, but the island is scourged by earthquakes. Signs of volcanic agency are noticeable in the oil springs and pitch wells. The island was supposed to form part of the domain of Ulysses. After the fall of Athens it passed to Sparta, then to the Romans, the Normans and the Venetians, who held it from the 15th century till 1797. In 1799 the Russians took it from the French, but it was afterwards seized by the British, who held it until in 1864 it was restored to Greece. Zante (14,650), the capital, situated on the east coast, is the seat of a Greek archbishopric and of a Catholic bishopric. Pop. of island, 45,032.

Zanzibar, an island in the Indian Ocean in 6° S., between 20 and 30 miles from the coast of German East Africa, forming part of the Sultanate and British Protectorate of Zanzibar. It occupies an area of 640 square miles. The authority of the Sultan, or Seyyid, on the mainland formerly extended from Tunghi Bay to Warsleikh (1,100 miles), but the southern portion as far as Wanga was ceded to Germany in 1890. In that year Seyyid Ali accepted a British protectorate, and the revenue, troops and administration are in British hands. Cloves and cocoa-nuts are the chief products. The inhabitants are very mixed in consequence of a long period of intermarriage between various East African native races and Arabs, Persians and other traders. Pop., 250,000.

Zara, the capital of Dalmatia, Austria-Hungary, 170 miles S.E. of Venice. Situated on a promontory on the Adriatic, opposite to the island of Ugliano, it is a seaport of some consequence. It is an ancient place, having been a prosperous colony in Roman times. It passed under the protection of Venice in the 11th century, though Hungary made several efforts to annex it (sometimes successfully) before its purchase by the Venetian Republic in 1409. In 1792 it was transferred, along with Venice, to Austria. It contains many monuments of its interesting history, and its Venetian aspect recalls its former associations. Amongst the most prominent buildings are the church of San Donato, alleged to date from the 9th century, occupying the site of a temple of Juno; the Romanesque cathedral of St. Anastasia, founded in 1202 by the Doge Enrico Dandolo in celebration of the recapture of the town from the Hungarians in that year; the Loggia del Comune, containing the public library; the old gate of Porta Marina and the landward gate of Porta di Terraferma; the Governor's

residence, once the Palace of the Priors; the Episcopal Palace, and the Imperial Fountain. Glass-making and fishing are carried on, but the principal industry is the manufacture of the famous liqueur known as maraschino, so called because it is distilled from the marasco, or wild cherry, which covers the Dalmatian highlands. Pop. (1900), 32,550.

Zealand (Dutch, ZEELAND), the most south-westerly province of Holland, bounded on the N. by South Holland, on the E. by North Brabant, on the S. by Belgium and on the W. by the North Sea. It is mostly composed of the islands of Walcheren, North and South Beveland, Tholen and Schouwen, lying between the mouths of the Scheldt and the Maas, and occupies an area of 690 square miles. Much of the surface is below the level of the sea, from which it is protected by dykes. The chief crops are grain, potatoes, hemp, flax, turnips and madder, and the leading industries are dairy-farming, cattle-raising, fisheries, distilling, shipbuilding, linen-weaving, salt-refining and tile-making. Middelburg (19,000), in Walcheren, is the capital. Pop. (1905), 227,292.

Zebra (*Equus zebra*), a striped wild ass from the mountain regions of Cape Colony. It stands



ZEBRA.

about four feet at the shoulder; the ground-colour is white marked with black stripes, except on the under-surface and the inside of the thighs; the legs and base of the tail are barred with black. The Daww, or Burchell's Zebra (*E. burchelli*) is larger and more stoutly built, the ground colour is yellowish-brown, and the limbs are nearly white. Grevy's Zebra (*E. grevyi*) is the name given to a form from the Galla country. Some authorities consider it a variety of the True Zebra. Unfortunately the numbers of this elegant creature are rapidly decreasing and it seems doomed to extinction at no very distant date. [QUAGGA.]

Zebu, a general name for the humped cattle of India (*Bos indicus*). Of this species there are several breeds. In all the distinguishing feature is the hump on the shoulders, which in the larger forms reaches a weight of 50 lbs., and is esteemed a delicacy.

Zeitz, a town of Prussian Saxony, Germany, on the White Elster, 23 miles S.W. of Leipzig. The principal buildings are Trinity Church in the Gothic,

dating from the 15th century, but containing a Romanesque crypt of the 12th century; the gymnasium, once a Franciscan monastery, with a good library; and the Moritzburg, built in 1564 by the Duke of Saxe-Weitz on the site of the Episcopal Palace, and now utilised as a reformatory. The manufactures comprise textiles, machinery, pianos, gloves, tobacco, sugar, soap and perfumery, and iron-founding, dyeing and calico-printing are carried on. Pop. (1900), 27,391.

Zelle, or CELLE, a town of Hanover, Prussia, Germany, on the Aller, which here becomes navigable, a right-hand affluent of the Weser, 22 miles N.E. of Hanover. The church contains the graves of Sophia Dorothea, first wife of George I., King of Great Britain and Ireland, and of Caroline Matilda, the divorced wife of Christian VII. of Denmark and sister of George III. She resided under compulsion in the beautiful ducal castle from 1772 until her demise in 1775. The Zelle line of the Dukes of Brunswick-Lüneburg became extinct in 1705. The manufactures include woollens, paper, tobacco, printers' ink and philosophical instruments, and nursery-gardening flourishes in the suburbs. Pop. (1900), 19,872.

Zend. [IRANIC LANGUAGES.]

Zenith of a place is the point immediately overhead. It is thus the visible pole of the horizon, i.e., if we imagine a line drawn from the centre of the earth at right angles to the plane of the horizon, it will cut the sky in the point which is the zenith of the place under consideration. [NADIR.]

Zennor, a parish of Cornwall, 5 miles W. of St. Ives. The church of St. Senara is principally Perpendicular, but some of the windows are Early English. Two ancient crosses stand in the churchyard. The parish is remarkable for the variety of its prehistoric remains, which include cromlech, bee-hive houses, the relics of a stone circle, logan stones and cairns. Pop. (1901), 332.

Zenobia, SEPTIMIA, Queen of Palmyra, flourished in the 3rd Christian century and is supposed to have belonged to a family of Arabic origin. On the death of her husband Odenathus in 266, she assumed the purple as regent for her sons. Though she ruled on the whole with justice and magnanimity, she fell a prey to ambition, aspired to be Queen of the East, and provoked the wrath of Rome. In 272 the Emperor Aurelian led an army against her, and after several victories captured Palmyra. Zenobia was conveyed to Rome and led in triumph through the streets, but eventually was allowed to reside on a large estate near Tivoli. It is said that, stung by jealousy, she consented to the death of her husband, because she thought he preferred his son by a former wife to his two sons by herself. Then, stricken by remorse, she had the assassin slain.

Zeolites, a group of hydrous silicates of aluminium with some of the alkali metals, named from the Greek *zeo*, "I boil," because most of them when heated before the blowpipe give off their water of crystallisation with a frothing, or intumescence.

Zerbst, a town of the duchy of Anhalt, Germany, on the Nuthe, a right-hand tributary of the Elbe, 70 miles S.W. of Berlin. The principal buildings are the spacious church of St. Nicholas, in the Late Gothic of the 15th century; the town hall, containing a museum with relics of Martin Luther, Philip Melancthon and Lucas Cranach the younger; and the gymnasium, occupying an old Franciscan monastery. Two interesting features in Zerbst are the Roland Column, dating from 1445, in the market-place, and the bronze figure of the Butter Girl, the origin of which is unknown, but which is popularly regarded as the town's palladium. The manufactures include beer (a famous variety), gold and silver ware, machinery, textiles and chemicals. Nursery- and market-gardening are also profitably carried on. Pop. (1905), 18,128.

Zero, or 0, was the last symbol introduced into Notation. The word is also used in connection with many instruments, the points from which measurements are made being often termed the Zero point, and the corresponding position of the instrument the Zero position.

Zetland. [SHETLAND.]

Zeuglodon, the earliest genus that can be with certainty assigned to the Cetacea. It occurs in the Eocene, especially in Alabama, Louisiana, Mississippi and Arkansas, but has been found in the Barton Clay of Hampshire. The name means "yoked teeth" from the double fang, the genus having originally been thought reptilian, and named *Basilosaurus*. The molar teeth have compressed crowns with serrated edges.

Zeus, the greatest of the Olympian gods and father of gods and men, was a son of Cronos and Rhea and brother of Poseidon, Hades, Hestia, Demeter and Hera. On the division by lot of the government of the world Zeus (Jupiter) acquired the heavens, Hades (Pluto) the lower regions, and Poseidon (Neptune) the sea. He married Hera (Juno), by whom he had Ares (Mars), Hephestus (Vulcan) and Hebe. As the fruit of his many amours he was the father of Athena (Minerva)—who sprang from his head,—the Hours, the Fates, the Graces, the Muses, Hermes (Mercury), Apollo and Artemis (Diana). His chief place of worship was Mount Olympus in Thessaly, where he dwelt along with the other gods. Sacred to him were the eagle, oak and mountain tops and goats, bulls and cows were his usual sacrifices. His attributes were the sceptre, eagle, thunderbolts, and in his hand a figure of Victory and sometimes a cornucopia.

Zeuxis, one of the greatest painters of ancient Greece, was born at Heraclaea (but whether at the city of this name in Tarentum in Italy or on the Black Sea is not known, though probably the latter) and flourished in the second half of the 5th century B.C. He lived chiefly in Athens, where he died some time before 355. He was inordinately vain and frequently presented his works to cities or friends on the plea that, since they were priceless, he could not place a value on them. His most celebrated works (which have all perished) included "Helen" painted for the town of Croton, "Infant

Hercules strangling the Serpent," "Female Hippocentaur," "Zeus Enthroned" and "Marsyas Bound." His marvellous gift of imitation is the theme of several anecdotes.

Zimbabwe. [SOUTH AFRICA.]

Zinc (chemical symbol, Zn; atomic weight, 65). The preparation of zinc on a manufacturing scale was started at Bristol in 1743, and for many years little competition existed. The chief ores of zinc are the sulphide and the carbonate, known respectively as blende and calamine. The former occurs largely in Cornwall, Derbyshire, the Isle of Man, Cumberland and North Wales, the latter chiefly in Spain and the United States. For the preparation of the metal from either of these sources, the ore is first roasted in furnaces or kilns, by which means it is converted into oxide with the loss of sulphur dioxide or of carbonic acid. This oxide is then well mixed with coal-dust and heated in clay retorts, and the reduced metal distilled over into attached clay receivers. The metal is usually remelted, skimmed and cast in ingots; it is never pure, containing usually, quantities of lead, iron, tin and arsenic associated with it. Zinc is a bluish-white metal which melts at about 430° C. and distils at a little over 1,000°. It may be rolled or beaten into leaves, but impurities impair this power. It may, by slowly cooling the molten metal, be obtained crystalline, and a bar of zinc emits when bent a slight crackling sound. It has a specific gravity of about 7, and though if strongly heated it burns with the formation of a green flame and thick white fumes, yet at ordinary temperatures it is unalterable in moist air. Pure zinc is hardly attacked by acids, but the commercial metal is readily dissolved with the evolution of hydrogen and the formation of zinc salts. It forms one oxide, ZnO, which occurs native as red zinc-ore and, combined with other oxides, as franklinite. The chloride, ZnCl₂, is obtained as the hydrate, ZnCl₂·OH₂, by the evaporation of the solution formed by dissolving zinc in hydrochloric acid.

Zirknitz, an occasional lake, also known as JESSERO, in Carniola, Austria, 24 miles S.S.W. of Laibach, about 1,900 feet above the level of the sea. Its existence depends upon the rainfall, the porous nature of the soil and surrounding hills draining it or filling it, as the case may be. Professor James Geikie says that the river Planina, in the valley of which the lake forms, "after flowing underground for a long distance, returns to the surface and shortly afterwards winds through a wide plain encircled by high cliffs of limestone. The plain is pierced by hundreds of dolinas [funnel-shaped depressions communicating with underground galleries, popularly known as swallow-holes], from which, after excessive or continuous rain, the water wells and rushes until the whole wide area is transformed into a lake. The extent and depth and the duration of this temporary lake vary; and the intervals between its successive appearances are likewise inconstant; sometimes only a year, or two or three years may elapse, but intervals of ten and even of thirty years have been experienced."



ZODIACAL LIGHT

Ziska, or **Zizka**, JOHN, the hero of the Hussite War, was born of a noble family at Trocznov, in Bohemia, about 1360. He strove in vain to induce King Wenceslaus to give active support to the Hussites, and was thus driven into open rebellion. After the outbreak of 1419 he was chosen commander-in-chief, and organised an army which was victorious over the Emperor Sigismund at Mount Wittkow (July 1420). In 1421 the citadel of Prague fell into his hands and, although a wound received at Raby in the same year rendered him totally blind (he had been without the sight of one eye from boyhood), he gained a series of victories over the Imperial forces, which at length induced Sigismund to promise the Hussites the free exercise of their religion. Whilst the negotiations were proceeding Ziska was attacked by the plague during the siege of Przbislaw, 28 miles S.E. of Czeslau, and died on October 11th, 1424.

Zither, a stringed instrument with a large shallow resonance-box and a circular sound-hole in the middle, across which pass the strings from the finger-board. The thumbs and first three fingers of both hands are used in playing. The thumb and fingers of the left hand are placed on the frets, the three fingers of the right hand manipulate the bass and accompaniment strings and the right thumb (furnished with a ring usually of silver or gold) strikes the melody strings. It is the favourite instrument of the peasants of Styria and the Bavarian Alps.

Zittau, a town of the kingdom of Saxony, Germany, on the left bank of the Mandau, 47 miles E. by S. of Dresden. The principal buildings include the town hall, the churches of St. John and of St. Peter and St. Paul, and the Johanneum. The town has several important educational institutions and is a leading centre of the textile industries in Saxony. There are also iron-foundries, saw-mills, brick-fields and potteries. Zittau suffered seriously in the Hussite Wars, the Thirty Years' War and the Seven Years' War. Pop. (1905), 34,719.

Zoea, a stage passed through during the development of many species of the higher Crustacea. The larva has a massive head, with large paired eyes, a median spine, and several pairs of appendages; behind this is a jointed abdomen without any appendages. It is so different from the adult that it was regarded as a distinct animal.

Zoantharia, a sub-class of the Actinozoa or Anthozoa, including those in which the tentacles are simple, arranged in one or more circles. The number of the mesenteries and tentacles is generally either six or a multiple of six, and never of eight or some multiple of eight, as in the Alcyonaria. It includes three groups—the Actiniaria or Sea Anemones, the Antipatharia or Black Corals, and the Madreporaria or true Corals. They are all marine.

Zodiac is a belt of the heavens extending about 8° on either side of the ecliptic. This gives it a width of 16°, and it was so chosen by the ancients since it included the paths of the planets then known—Mercury, Venus, Mars, Jupiter and Saturn. But the discoveries of the 19th century have

shown that the planets are by no means confined to this zone, many of the asteroids travelling far beyond its limits. The zone was so named on account of certain resemblances to animals, which early astronomers imagined to be possessed by the constellations within it. The ecliptic and equator bisect each other in a line, and the points in which this line cuts the sphere of the heavens are called the equinoctial points, [EQUINOX.] That point which marks the passage of the sun from south to north across the equator is called the vernal equinox, and has always been considered a convenient starting-point for many astronomical measurements. When the zodiac was first used, this point was known as the first point of Aries, the first six signs being then to the north and the last six signs to the south of the ecliptic. But, owing to the movement of the earth's axis, the vernal equinox moves backwards on the ecliptic about 50 seconds in a year, so that now the constellation of Aries seems to have moved about 30 degrees forwards. For convenience, however, the vernal equinox is still called the first point of Aries, and 30° farther on will be the beginning of Taurus, while the autumnal equinox will occur at the first point of Libra. As time goes on these divisions will get farther and farther away from the constellations of the same name, but in about 25,800 years the whole circuit will be accomplished, so that sign and constellation will again be united.

Zoetrope, an instrument or toy whose action depends upon the persistence of vision. A number of pictures representing the different positions successively assumed by a moving object are rapidly presented to the eye. But the eye has not ceased to see one picture (although the picture has passed away) before the next is presented to it, and so, instead of viewing it as a new picture, it merely seems as though the object in the first has changed its position to that shown in the next. As the rest of the series comes into view, it seems to the eye as though the object were actually moving into the various positions indicated on the picture. The principle of the toy developed ultimately into the Bioscope and Cinematograph.

Zokor (*Niphus aspalax*), a mouse-like Rodent of the family Muridae, occurring in the Altai Mountains in Central Asia. Its eyes are very small, the external ears are mere rudiments, the body is cylindrical, and the fore feet are armed with long strong claws, of which that on the fifth toe is longer than the toe itself. It lives in subterranean runs of much greater extent than those of the Mole, and in burrowing employs its strong incisor teeth to cut through roots and, if need be, to loosen the earth. These runs are constructed very near the surface, in order that the creature may feed on the tender roots of grass.

Zola, ÉMILE ÉDOUARD CHARLES ANTOINE, novelist, was born in Paris on April 2nd, 1840, and educated at Aix, Paris and Marseilles. While engaged as a clerk in the well-known publishing house of Hachette, he took to novel-writing, his *Contes à Ninon* being issued in 1864. Two years later he gave

up trade and took to literature. In 1871 appeared the first volume of the series of novels known as *Les Rougon-Macquart*, comprising (amongst others) *L'Assommoir*, *Nana*, *Germinal*, *La Terre*, *La Bête Humaine*, *La Débâcle* and *Dr. Pascal*. In these works he discussed with extraordinary power and almost brutal force the questions of heredity and environment. *Lourdes*, *Rome* and *Paris* (1898)



EMILE ZOLA.
(Photo: Nodur, Paris.)

formed a trilogy of stories on towns, while *Fecundité* (1899), *Travail* and *Vérité* belonged to a quartet of novels in which the problems of Society were to be considered. In 1898 Zola was tried and sentenced for defamation of the army (in connection with the Dreyfus scandal), but the verdict was quashed and a new trial ordered. At the second trial (1898), judgment was allowed to go by default, and Zola left Paris before judgment was notified to him, and lived for some time in England. In 1900 an Amnesty Bill was passed (Dreyfus having been pardoned). On the morning of September 29th, 1902, Zola was found dead, accidentally killed through asphyxia owing to a charcoal fire.

Zollverein, a customs-union organised and entered into by the autonomous states within a country in order to secure uniformity of tariff rates and convenience in the collection of them. Apparently the need for such a union first became acute in the German states in which the varying charges amongst the different kingdoms and principalities threatened serious detriment to trade. In 1828 Prussia and Hesse arrived at a common understanding on the subject and the other states fell into line in later years, until the constitution of the German Empire in 1871 rendered the Zollverein an accomplished fact. Though the tariff is levied for

revenue, or for protection against the foreigner, or for both purposes, yet it is consonant in theory and practice with inter-state free trade. An obvious actual advantage of the customs-union is that it enables the different states to act as one in negotiations with other countries touching trade and commerce.

Zona, an alternative name of the skin disease known as Herpes zoster, or shingles.

Zones, in geology, beds characterised by one or more distinctive fossils which, if not confined to their particular zone, are at least most abundant in it.—In geography the term is employed to designate the five great zones of the earth's climate, namely, the torrid zone extending from tropic to tropic (i.e., from $23\frac{1}{2}^{\circ}$ N. to $23\frac{1}{2}^{\circ}$ S. of the equator); the north temperate zone from $23\frac{1}{2}^{\circ}$ N. to the North Polar circle ($66\frac{1}{2}^{\circ}$ N.) and the south temperate zone from $23\frac{1}{2}^{\circ}$ S. to the South Polar circle ($66\frac{1}{2}^{\circ}$ S.); and the two frigid zones, one extending from the polar circle northwards and the other from the polar circle southwards.

Zoological Station, a seaside laboratory for the investigation of the marine animals and plants of a district, fitted with tanks in which organisms can be reared and their development watched. The best-known stations are those at Naples, Hamburg, Plymouth and St. Andrews.

Zoology, the branch of Biology which deals with animals as distinct from that other branch, Botany, which deals with plants. Some writers attempt to separate Zoology from Natural History, using the first term to include the study of the structure and activities of animals and the second for the study of animals and groups of animals in their relations to one another and to their environment. Our definition includes the second as a branch of the first. The Middle Ages produced much literature about animals, chiefly legends and moralities, but no systematic treatise on the subject appeared till 1552, when Edward Wotton (1492-1555), an Englishman, published at Paris his book *De Differentiis Animalium*, in which he made use of Aristotle's divisions, adding the Zoophytes, in which he includes the starfishes. Next came Gesner (1516-65), and Aldrovandi (1522-1605), and then Ray (1628-1705), the forerunner of Linnæus (1707-78), whose *Systema Naturæ* entitles him to be reckoned the founder of systematic zoology. The chief classifications since his day are those of Cuvier (1769-1832), H. Milne-Edwards (1800-84), Huxley (1825-95), Haeckel (b. 1834) and Sir Ray Lankester (b. 1847).

Zoophyta, from the Greek, meaning "animal-plant," a term used to designate the large group of lower invertebrate animals with plant-like habits. The name is attributed to Edward Wotton (1552), who included under it the holothurians, starfishes, jellyfishes, sea-anemones and sponges.

Zoospore, motile spores, or reproductive masses of protoplasm, occurring among the Chlorospermous and Melanospermous algae, and the Myxomycetes, Saprolegniæ and a few other fungi.

Zopherus, a genus of Beetles of the family Tenebrionidae composing the sub-section Atrachelia of the section Heteromera, or Beetles with five-jointed tarsi to the four anterior, and four-jointed tarsi to the two posterior legs. The family is one of the largest of the order Coleoptera, about 5,000 species having been described. *Zopherus bremeri* is the most interesting example of the genus. It is an inch in length, of stony hardness of integument, and extreme tenacity of life.

Zorilla, or CAPE ZORILLA (*Ictonyx zorrilla*), a bear-like animal belonging to the Mustelidae, or Weasel family. It occurs throughout the whole of Africa and extends also into Asia Minor. Its body is twelve inches long, moderately stout and of a glossy black ground-colour, marked with white bands and spots. The snout projects an inch or so beyond the mouth; the tail is bushy, about nine inches long, striped or spotted. The zorilla is carnivorous, feeding upon mammals, birds and their eggs, amphibia and crustacea, and especially upon poultry. Occasionally it is tamed and used to catch rats and mice. The secretion of its tail glands is almost as offensive as that of the skunk.

Zoroaster, or ZARATHUSTRA, the founder or reformer of the old Persian religion. His period, birthplace, and personal history are unknown, but authorities maintain that he cannot have lived later than 800 B.C. His main doctrine was the eternal warfare between the two creative powers—Ormuzd, the god of light and the author of all good, and Ahriman, the god of darkness and the creator of evil. Ormuzd is attended by angels of grace, Ahriman by ministers of evil. Ormuzd planted free will in man, whose future state depends on the life he leads on earth, and will in the end subdue and redeem even Ahriman and his satellites.

Zug, a canton of Switzerland, bounded on the N. by Zürich, on the E. and S. by Schwyz, and on the W. by Lucerne and Aargau. It occupies an area of 92 square miles, and is virtually the second smallest canton in the league, which it joined in 1352. It contains the battlefield of Morgarten where, on November 15th, 1315, the Confederates defeated the Austrians. The surface is mountainous in the south and south-east, the Kaiserstock reaching a height of 8,528 feet. The Reuss and Sihl, boundary streams, and the Lorze are the chief rivers. Lake Egeri and most of Lake Zug lie within its limits. Agriculture and dairy-farming flourish, and the manufactures include paper, leather, silk and cotton. The capital is Zug (6,508), on the north-eastern shore of the lake. Pop. (1905), 25,881.

Zuider Zee, an arm of the North Sea extending into the north of Holland, bounded on the E. by Friesland and Overijssel, on the S. by Gelderland and Utrecht, and on the W. by North Holland. It is largely shut in on the north by the Frisian islands Texel, Vlieland, Terschelling and Ameland, which once formed a continuous land mass separating the ancient Zuider Zee from the ocean. The mass was broken through at different points by the sea towards the end of the 13th century, and the

Zuider Zee now communicates with the North Sea by different channels. The greatest length from north to south is 80 miles, and the greatest breadth from east to west 34 miles, the mean depth being 12 feet, and the greatest 40 feet. It contains the islands of Wieringen, Marken and Schokland, and several islets. Its principal feeders are the Kunder, Zwart, Yssel, Eem, Vecht and Amstel. The North Sea Canal from Amsterdam to Ymuiden and the Helder Canal have absorbed all the important commerce, and the manifest destiny of at least the southern basin of the Zuider Zee is union with the mainland by means of drainage or other system of reclamation.

Zuloaga, IGNACIO, painter, was born in 1870 at Eibar, a town in the Basque province of Vizcaya, Spain. He comes of a family of artists, who have powerfully contributed to the revival of art in their native land and whose leading characteristics are dramatic force, direct handling and colour. In these respects, which may be summed up as a return to Nature, Zuloaga may be described as the chief of the modern school. Amongst his best pictures are "Préparatifs pour la Course de Taurcaux," "Un Mot piquant," and "Gitane et Andalouse," which were exhibited in 1903 at the Salon des Beaux Arts in Paris.

Zulu-Xosas, or ZULU-KAFFRES, a main division of the Bantus, whose original domain comprised the whole of the south-eastern seaboard of Africa from Delagoa Bay to Great Fish River, and extended from the coast inland to the Quathlanbha and Drakenberg ranges. The Ma-Zitu, Ma-Ravi, Ma-Ngone and other Zulu hordes north of the Zambesi have been brought under subjection or dispersed by the Germans in East Central Africa or by the British in Nyasaland. Cetewayo, the last of Chaka's dynasty, was overthrown by the British in 1879, and after his death (1884) Zululand itself was annexed to Natal on December 30th, 1897. The Zulu-Xosas are a fine Negroid people, tall (averaging 5 feet 10 inches), symmetrical, and well-built, but betraying Negro blood, especially in the thick lips, dark colour, and woolly hair. Mentally and morally they are superior to the full-blood Negro, displaying considerable intelligence in their social and political systems.

Zurbaran, FRANCISCO DE, painter, was born of poor peasants at Fuente de Cantos, Extremadura, Spain, on November 7th, 1598. Like Giotto, he taught himself drawing in the fields, and when his talent became evident his people contrived to send him to Seville, where he studied under Juan de las Roelas (1558-1625). In 1623 he undertook to paint nine pictures illustrating the history of St. Peter for the Cathedral of Seville, and about 1628 produced his finest allegorical work, "The Apotheosis of St. Thomas Aquinas." In 1629 appeared his "St. Bonaventura displaying the Crucifix to St. Thomas Aquinas," and between this year and 1633 he executed "San Hugo visiting the Monks in their Refectory," "St. Bruno conversing with Urban II.," and "The Virgin shadowing with her Mantle a Company of Carthusians." About 1633 he was

appointed Painter to the King (Philip IV.), and in the same year produced the greatest of his religious compositions, "The Adoration of the Shepherds." Between 1633 and 1650 he was busily employed painting for the churches and convents of Seville, and in 1650 was summoned to the Court, it is said, at the instigation of Velazquez. He is believed to have died in Madrid in 1662. In the National Gallery in London he is represented by "The Manger," "A Monk in Prayer," and "St. Margaret," three remarkable examples of his genius. He was one of the greatest of the purely Spanish artists.

Zürich, a canton of Switzerland, bounded on the N. by Schaffhausen, on the E. by Thurgau and St. Gall, on the S. by Schwyz and Zug, on the W. by Aargau and on the N.W. by Baden, from which it is largely separated by the Rhine. It covers an area of 666 square miles. In the north the surface is undulating and plateau-like and more hilly in the south, where the Schnebelhorn rises to a height of 4,250 feet. The canton lies in the basin of the Rhine and is watered besides by the Thur, Töss, Glatt, Limmat, Sihl and Reuss. Lake Greiffen, Lake Pfäffikon and most of Lake Zürich belong to the canton. Though the soil is not infertile in many parts, Zürich is predominantly an industrial canton. It joined the Swiss League in 1351, supported the Reformation initiated by Zwingli in 1519 and possesses the most democratic constitution, the principle of the Referendum being recognised to its fullest extent. Pop. (1905), 459,269.

Zürich, the capital of the preceding canton and the largest and most important city in Switzerland, on the Limmat at its exit from the north-western extremity of Lake Zürich, the river dividing the town into the Grosse Stadt on the right and the Kleine Stadt on the left bank. There are handsome bridges, quays and promenades, the situation of the city being remarkably beautiful. The chief buildings are the Town Hall, National Swiss Museum, Polytechnic (containing the University and Technical Institute), the Grossmünster, the Frau-Münster, the Wasserkirche (housing a library and Zwingliana) and the Pestalozzianum, besides numerous educational establishments of the highest order of merit. The manufactures include silks, cotton, paper, machinery and iron. Pop. (1905), 180,843.

Zutphen, a town of the province of Gelderland, Holland, on the right bank of the Yssel, 9 miles S. of Deventer. The church of St. Walburga contains some beautiful specimens of old metal work in addition to the monuments of the counts of Zutphen. Besides weaving, there are manufactures of oil, leather and paper, while timber from the Black Forest and grain from Central Europe are floated hither by the Rhine and Yssel. The town is memorable in connection with the familiar episode of the self-denial of Sir Philip Sidney, who was mortally wounded in a conflict with the Spaniards under its walls in 1586. Pop., 18,400.

Zwickau, a town of Saxony, Germany, on the Mulde, 60 miles S.W. of Dresden. The chief buildings are the Marienkirche, a fine Late Gothic structure of the 15th century; the Katharinenkirche, of which Thomas Münzer, the Anabaptist, was pastor in 1520-2; the Town House; the Gewandhaus, once the Drapers' Hall, now a theatre; the Gymnasium (with public library), the law courts and hospital. The manufactures comprise machinery, textiles, paper, chemicals, porcelain, glass, and hosiery, besides saw-mills, brick-fields, iron-foundries and breweries. Pop. (1905), 68,502.

Zwingli, HULDBEICH (ULRICH), Reformer, was born at Wildhaus, in the canton of St. Gall, Switzerland, on January 1st, 1484. After studying philosophy at Bern and Vienna, he repaired to Basle. In 1506 he was ordained and appointed to the parish of Glarus. In 1516 he was transferred to Einsiedeln, where his sermon denouncing image-worship and the superstition of pilgrimages created intense excitement. He removed to Zürich at the opening of 1519 as preacher in the cathedral. He signalled his entry on his new office by his successful resistance to the sale of indulgences carried on by the travelling friar Samson. The bishop of Constance endeavoured to awe him into silence, but a controversy at Zürich between Zwingli and his vicar-general, John Faber, resulted in the formal adhesion of the city to the principles of the Reformation (1519). In 1520 a war broke out between the Protestant and the Roman Catholic cantons. At Cappel, in 1531, the men of Zürich were routed, and Zwingli himself fell on the 11th of October in that year, meeting a hero's death.

Zwolle, the capital of the province of Overijssel, Holland, on the Swarte Water, a righthand feeder of the Yssel, 18 miles N. of Deventer. It was an Imperial Free city and a member of the Hansatic League and joined the United Provinces in 1580. The industries comprise shipbuilding, dyeing and bleaching, iron-founding and tanning, besides manufactures of cotton, rope and salt. On a hill near the town stands the Augustinian convent of Agnetenberg of which Thomas à Kempis was superior at his death in 1471. Pop. (1905), 32,817.

Zygospore, a botanical term employed to describe the product of conjugation of spores, in some algae and fungi, when there is no difference between the male and female element.

Zymotic Diseases, the acute specific diseases which are regarded as being caused by the growth and multiplication within the system of a ferment or leaven. The term "zymotic death-rate" is applied to the death-rate from the "seven principal zymotic diseases" (smallpox, measles, scarlet fever, diphtheria, whooping cough, fever and diarrhoea). The term was introduced in 1842 by Dr. William Farr (1807-83) in a letter to the Registrar-General.

